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COLLECTIVE REVIEW

EVALUATION OF THE PRINCIPLES CONCERNED IN THE MANAGEMENT OF TRAUMA TO THE KIDNEY

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A REVIEW of the voluminous literature on trauma to the kidney is quite disconcerting. There is a marked divergence of opinion regarding several important problems concerned in the management of renal injuries.

These problems are:

1. The proper method of examining patients who have sustained a renal injury—whether by means of excretory or retrograde pyelography, or both.
2. Whether to practice systematic surgical intervention or conservative expectant treatment.
3. The indications for surgical intervention and the time for such interference.
4. Whether to repair the kidney or remove it.
5. The late results that may be expected following the various types of immediate treatment.

In order to answer these problems, I have undertaken a collective study of the literature and have reviewed our 27 cases of renal injury at Beekman-Downtown Hospital.

ANALYSIS OF 27 CASES AT BEEKMAN-DOWNTOWN HOSPITAL, (1940–1948)

ETIOLOGY

The oldest patient in this series was 76 years of age and the youngest was 17 years. The average age was 44.6 years. All of the patients were males. In 16 cases the right side was involved and in 11, the left side.

Nature of the injuries. The injuries to the kidney were often variable and disproportionate to the violence to which the patient had been subjected. They were due to:

1. Direct force—such as sudden severe external trauma to the loin, over the kidney; falls striking the back or abdomen; and crushing force as when run down by automobile (14 cases).
2. Indirect force—such as falls with the body landing upon the head, feet, buttocks, without direct trauma over the kidney area (9 cases).
3. Kicks or blows over the kidney—the patients attributed their injuries of the kidney to probable blows sustained while playing football (2 cases).
4. Penetrating or puncture wounds—there was 1 gunshot wound.
5. No demonstrable cause or history of injury—there was 1 case of spontaneous perforation of the ureter.

PATHOLOGY

In this series, there were 11 cases of contusion, 14 of rupture, 1 case of traumatic hydrocele of the kidney, and 1 of spontaneous perforation of the ureter. The severity of the injury did not depend, as a rule, on the trauma producing it, nor upon the manner in which it was applied.

SYMPTOMS

The symptoms were variable and inconstant.

1. Shock was present in 14 cases and absent in 13 cases. In 6 it was quite severe on admission,

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and 3 of the patients in the last group never completely recovered from their shocked condition.

2. Pain was present in 21 cases. It was limited to the loin on the injured side in 10 cases, to the loin and abdomen on the injured side in 13, and to the loin, abdomen, and chest in 4.

3. Tenderness was present in the costolumbar region in all but 1 of these cases.

4. Muscular rigidity was present in the loin of the injured side in 23 cases, over the corresponding side of the abdomen in 11, and generalized over the abdomen in 5.

5. Hematuria was present in 26 cases and absent in 1 case. It was microscopic in 9, and gross in 17. Six of the patients could not void after admission, and had to be catheterized, at which time gross hematuria was discovered. There were 2 instances of severe secondary bleeding in patients allowed out of bed too soon, and 2 cases in which the bleeding persisted and was profuse in nature. There was no correlation between the severity of the injury and the amount of hematuria, as in many of these cases the injury appeared to be trivial and the hematuria profuse.

6. A large retroperitoneal mass could be felt in 9 cases, and, although present, was missed in 2 other instances.

7. Abdominal distention was noted in 19 cases, and abdominal rigidity in 4. Pain in the lower quadrant on the side corresponding to the injury in association with psoas spasm was found in 3 instances.

8. Anuria lasting from 24 to 36 hours was seen in 2 patients who were not in shock. This was believed to be due to suppression on the injured side and reflex urinary suppression of the contralateral kidney.

9. Severe bruises, discolorations, and ecchymosis in the affected loin were present in 12 cases and absent in 15.

10. A severe secondary anemia out of all proportion to the amount of hematuria was noted in 6 cases.

A review of the symptoms disclosed that there was no apparent relationship between their severity and the actual injury sustained by the kidney. The symptoms were variable, inconstant, and confusing and did not justify more than a presumptive diagnosis. In 2 of the cases, the symptoms and signs were entirely those of a ruptured intra-abdominal viscus, the injury to the kidney only being realized at a later date.

DIAGNOSIS

The following diagnostic measures were used in this series:

1. A simple abdominal film was taken in 19 cases. It gave only suggestive evidence of kidney injury in 4 cases, and was entirely misleading in 1 case. In the latter, the radiologist reported free air under the diaphragm which was not confirmed by exploratory laparotomy. The simple abdominal film was of value in determining associated lesions in 13 cases in which fracture of the transverse processes of the vertebrae, fracture of the pelvis, or of the lower ribs were diagnosed.

2. Excretory urography was done soon after admission in 20 cases. Satisfactory pyelograms for diagnostic purposes were obtained in 6. In 2 cases extravasation was suspected on the excretory study, but on retrograde study only one of these could be confirmed. In 2 other cases, although the intravenous pyelograms showed that the kidney had sustained an injury, there was no demonstrable evidence of extravasation. At operation, both of these kidneys were found to be badly ruptured. Valuable information concerning the uninjured kidney was obtained in 16 of the cases.

3. Cystoscopy and retrograde pyelography were done in 9 cases. Extravasation was suspected on the intravenous pyelogram in 2 cases; it was confirmed by the retrograde pyelogram in one instance, and disproved in the other; in 3 cases, although the excretory study was interpreted as normal, the retrograde study demonstrated extravasation. In 2 cases, the excretion on the injured side was indefinite but the retrograde study showed intraparenchymal rupture. In 1 case, there was no excretion visualized on the intravenous pyelogram but the pyelogram was normal by retrograde study. In another instance, observation cystoscopy disclosed a bleeding carcinoma of the bladder as the cause of the hematuria.

ASSOCIATED COMPLICATIONS

Serious complications were present in 19 cases, and absent in 8. Their prevalence and wide distribution in this and other such series stresses the absolute need of a complete physical examination. The kinds of complicating injuries in this series were as follows:

A. Fractures
- Skull—2
- Bones of face—2
- Lumbar vertebrae—5
- Sacrum—1
- Bony pelvis—2
- Wrist—1
- Clavicle—1
- Ankle—1
- Radius—1

B. Dislocations
  Ankle—1
  Separation of symphysis—1
C. Injury to viscera
  Rupture of liver—3
  Rupture of spleen—2
  Rupture of bladder—1
  Rupture of spleen—1
D. Other complicating injuries
  Pneumothorax—1
  Shift of mediastinum—1
  Hemothorax—2
  Perforation of diaphragm—1
  Laceration of brain—1
  Laceration of facial nerve—1
  Gas bacillus infection of leg—1
  Rupture of lung—1
E. Other complicating conditions
  Carcinoma of bladder—1
  Malaria—1

Three-quarters of the deaths in this series of cases were a result of the complicating injuries, and not the result of injury to the kidney which in these instances was trivial in nature.

TREATMENT

Expectant treatment. Twenty-two patients were treated conservatively. In 11 the injury was diagnosed as contusion; in 2, a laceration; and in 9, a rupture of the kidney. Four of these patients had to be operated upon, 2 because of the recurrence of profuse hematuria, 1 because of the development of an infected hydrocele of the kidney, and 1 because of sepsis due to a large perinephritic abscess as a result of extravasation. There were 2 deaths among the conservatively treated patients, a mortality of 12.5 per cent.

Conservative surgery. This was done in 4 cases. One patient had a decapsulation of the kidney and pyelostomy for an infected hydrocele of the kidney; 1 with spontaneous perforation of the ureter had an incision and drainage of the loin and pyelotomy; and 2 patients had an exploratory laparotomy, 1 of them because of a mistaken diagnosis of ruptured viscus, and 1 because of peritonitis due to a ruptured bladder, liver, and spleen. There was 1 death, a mortality of 25 per cent.

Radical surgery. Nephrectomy was done in 5 cases. Three of the patients were treated conservatively at first. In 1, because of profuse and persistent secondary hemorrhage, the kidney was explored, and was found to be ruptured although the excretory pyelograms showed no evidence of extravasation. In another patient treated conservatively the excretory pyelograms showed a dilated pelvis and ureter filled with blood clots but no evidence of extravasation. This patient had persistent gross hematuria for 2 weeks and was finally explored. A ruptured kidney was found and removed. The third patient who was treated conservatively ceased bleeding but developed severe loin pain with evidence of sepsis. Retrograde study revealed extravasation into a large abscess cavity. Nephrectomy was performed. One patient had a rupture of the kidney, liver, and lung due to a bullet; nephrectomy was the procedure of choice because of the severe bleeding. In the fifth case, the patient was explored abdominally because of signs pointing to a ruptured intra-abdominal viscus. The abdominal findings were negative but transabdominal nephrectomy was done for a pulpified kidney. There was 1 death in this group, a mortality of 20 per cent.

RESULTS

Deaths. There was a total of 4 deaths in this series of 27 cases, a mortality of 14.8 per cent. In 1 case only should the cause of death be attributed to the kidney (4.1%).

Cause of death—rupture of kidney. 1. A patient with persistent bleeding in whom the excretion showed no evidence of extravasation was finally subjected to operation because of a constant decline in the clinical picture due to hemorrhage. (At operation the kidney was found to be badly ruptured). This patient should have been operated upon earlier and I was entirely misled by the normal intravenous pyelograms.

Cause of death—severe associated injuries.

1. In the first patient there was a contusion of the kidney with hematuria which ceased soon after admission, but the patient died in 48 hours from a ruptured lung, pneumothorax, and mediastinal shift.

2. In the second patient there was also a contused kidney with a ruptured bladder, liver, and spleen, and a fracture of the tibia and fibula. The patient died soon after abdominal exploration and drainage, but at autopsy the kidney was found not to be severely injured.

3. In the third patient there was a ruptured kidney and spleen with compound fracture of the leg and gas bacillus infection of the extremity. Because the patient never came out of shock, he was treated conservatively. At autopsy, the kidney was not severely ruptured.

Late results. A follow up is available in 23 cases. In the 10 cases of contusion of the kidney, the end result is good, pyelographically and functionally. Four patients who had a nephrectomy are well and symptom-free. The 3 patients on whom

conservative surgery was done are all symptom-free and show normal pyelograms. There were 6 patients with a ruptured kidney who were treated conservatively. The result is poor in all, symptomatically and roentgenographically. In 2 of these a large cyst is present at the lower pole; in 4 the function of the injured kidney is reduced to less than 25 per cent of normal, and, in addition, in 1, the excretion of the contrast substance is not only faint, but the ureter is displaced far medially.

Experimental Evidence

The intelligent management of patients with a traumatic lesion of the kidney depends on the following factors: an understanding of the pathological physiology incident to such injury, the knowledge of the degree of function, and the anatomical integrity which the organ may be expected to regain when healing is complete.

Experimental investigation has made possible a better understanding of the pathology and physiology of renal trauma, and of the more effective management of such injury. The conclusions that can be drawn from the reported experimental work may be summarized as follows:

1. The resistance the kidney offers to rupture is due to the protection given to it by the powerful true renal capsule. For rupture of the kidney to occur, the force must be of such magnitude as to rupture the capsule, and even in such circumstances the protective function of the capsule continues. The latter fact may be an important factor in the spontaneous repair of wounds to the kidney (117, 142).

2. A simple and concise experimental classification has been developed by Stirling and Lands which gives us an excellent diagrammatic picture of renal injuries (142).

Type 1 injuries are mild injuries, chiefly in the perirenal fascia, producing small petechiae, with little or no trauma to the fibrous capsule.

Type 2 injuries consist of rupture of the fibrous capsule with minor lacerations of the cortex.

Type 3 injuries consist of moderate to extensive laceration of the parenchyma with or without involvement of the pelvis.

Type 4 injuries consist of pulpefaction of the parenchyma and laceration of the renal vessels.

3. Pathological changes incident to trauma involve the different components of the parenchyma and are of varying magnitude. The essential alterations may be summarized as follows (75, 104, 131, 149):

a. Glomeruli—congestion and hemorrhage into the glomerular cavity with marked thickening of Bowman's capsule.

b. Tubules—reversible and irreversible lesions may be seen, including necrosis and autolysis of the tubules with detachment of the basal layer which produces a tubule filled with amorphous substance. In very severe injuries, there may be a pseudoepitheliomatous transformation of the tubules into solid fibrous cords, with or without calcification.

c. Capsule—marked thickening and formation of a neocapsule.

d. Interstitial tissue—marked proliferation and wide separation of the tubules. Occasionally the connective tissue may undergo metaplasia and transformation into true osseous tissue.

e. Blood vessels—some are thickened by a true hyalin connective tissue transformation of the adventitia.

f. Process of repair—as tubular degeneration proceeds, there is proliferation of the interstitial tissue which bridges the gap with the aid of a blood clot. There is no regeneration of the tubules or glomeruli which are destroyed, and they are replaced by connective tissue which further serves to separate widely and compress the neighboring glomeruli and tubules. Scar formation is rapid in the kidney, and the process of repair has been shown to be far advanced after 6 days. Because of this scarring, the end result is one of varying degrees of distortion and cicatrization of the parenchyma (149, 156).

4. Following minor injury to the kidneys, there is practically no alteration in the renal function. After moderate injury, azotemia occurs, the blood urea nitrogen rises, and the phenosulfonphthalein excretion falls, but there is a gradual return to normal of these elements within 2 weeks. After very severe trauma, if the animal lives, none of these ever return entirely to normal levels. Severe renal injury is incompatible with life in the experimental animal if the opposite kidney has previously been removed. On the other hand, after extensive injury is inflicted on one kidney of a normal rabbit, renal function can be maintained by the opposite kidney. When the normal kidney is then removed on the eighth post-traumatic day, the injured kidney has recovered sufficiently to maintain renal activity at a satisfactory level (21, 102, 103, 104, 140, 149, 150).

5. Pyelograms taken immediately after the trauma, and at intervals of from 24 to 48 hours, a few days, and several months, reveal that good pyelograms are obtained immediately following the trauma, but that on subsequent days there is a gradual diminution in uroselectan or diodrast excretion, the maximum period of diminution being from the fifteenth to the thirtieth day after

injury. Pyelograms taken at a later date reveal either normal or relatively normal excretion, or complete or partial inability to excrete the contrast substance due to replacement of the parenchyma by scar tissue (36, 102, 103, 104, 105, 142, 149).

6. Researches in dogs on the vasoconstrictor reactions to contusion of the kidney reveal that after trauma the blood pressure is 150 mm. Hg in all, as compared to 119 mm. Hg before the contusion (148, 149).

7. In accordance with the classification outlined before, recovery is uneventful following Type 1 injury, while following Type 2 injuries, healing is slower, but recovery is also uneventful. About 80 per cent of the animals died at varying times after Type 3 injuries, although all of the animals with this type of injury who had operative repair survived. All animals with Type 4 injuries died (142, 145).

8. Experimentally untreated Type 3 traumatized kidneys in the animals that lived often gave rise to marked loss of function in the injured organ, and occasionally produced complications of such magnitude that some form of surgical intervention became necessary later (22, 109, 127, 141, 142).

9. Fat is an excellent hemostatic agent, and has been found to control bleeding in from ¾ to 1½ minutes while muscle does so in from 16 to 20 minutes. The efficacy of ribbon gut has also been demonstrated by Lowsley. In no case following experimental surgical repair was the kidney destroyed. Microscopically, actively functioning tubules and glomeruli are found at the edge of the reparative scar tissue in these surgically repaired kidneys (64, 75).

10. Fibrin foam, gelfoam, and oxycellulose gauze used in the control of bleeding kidney wounds produces a narrow scar with little or no sclerosis of the surrounding renal parenchyma (54, 74, 75, 76, 77).

11. Following severe injuries to the kidney, there may be a marked secondary anemia, persistent and unrelated to the hemorrhage. Reticulocyte counts suggest that this phenomena is due to toxemia from the degenerated and necrotic kidney tissue. Simultaneous depression of hemopoiesis by the toxic agent is not ruled out, however (140).

Symptoms and Signs

A review of the symptoms and signs of renal injuries in reported cases and in our series impresses one with the fact that there is a wide diversification of the clinical picture presented. There are no pathognomonic symptoms since any or all of the so-called classical symptoms of pain, hematuria, and shock may be absent. I wish to discuss briefly the symptoms that may be encountered in renal trauma, and to point out their implications.

Shock. If present, shock is usually slight at the outset and is proportional to the character and magnitude of the external force rather than to the extent of the actual kidney injury. Wesson (156) has pointed out that shock at the time of the trauma is usually due to injury of the solar plexus, whereas, if it occurs after a lapse of several hours, it is due to hemorrhage. If the degree of shock which has been present at the outset does not disappear in a relatively short time but shows a tendency to become aggravated, or if it continues to be severe, one should consider the possibility of an associated injury of the abdominal viscera, the thorax, or spinal cord, or of an exacerbation of bleeding from the kidney itself.

Hematuria. Microscopic or gross hematuria is a cardinal sign of renal injury, and occurs in from 75 to 90 per cent of the cases. It was found in 26 of the 27 cases in our series (96%). Hematuria may not appear for hours or days after the accident. Occasionally, it may be absent entirely if the injury is slight, if blood clots are blocking the ureter, if the ureter has been completely severed, if the pelvis has been torn off, or if the fracture line does not enter the pelvis or calyces. For all of these reasons, there is no correlation between the presence or absence, or the amount and duration, of hematuria with the existence or degree of the renal injury. As a general rule, however, the more profuse the hematuria, the more extensive the injury.

There is a tendency for the hematuria to cease by the fourth or fifth day unless the injury has been extensive, or unless secondary bleeding occurs. The latter is usually noted in the second or third week after the injury, and has been reported as late as 2 months; it differs from the primary bleeding in that it is more severe and persistent, and frequently gives rise to blood clots (40). Two of our patients had marked secondary bleeding on being allowed out of bed too soon, and on 1 of these, immediate nephrectomy had to be performed because of the alarming and persistent hemorrhage.

Bailey has estimated that in 8 per cent of the cases, acute retention ensues because of blood clots in the bladder (6).

Mass in loin. A mass in the loin on the affected side, found in 25 per cent of the complicated cases, is a feature of ruptured kidney. It was present in

11 (43%) of the cases in our series. The mass may be of variable size, and slow to rapid in its development; it is usually noted soon after the injury. As a rule, its size is an index of the degree of severity of the injury, and its palpation and delineation may be very difficult because of the accompanying loin rigidity and tenderness, and abdominal distention. Occasionally, the presence of a retroperitoneal mass or hemorrhage may be missed or overshadowed by the presence of the signs of peritonitis. Backus has reported 7 such cases, in 6 of which the patient was subjected to exploratory laparotomy with negative abdominal findings (5).

The mass may be absorbed, and the time required for such absorption is directly proportional to the initial size of the mass. Infrequently, it may become encysted and calcified, and form a large calcified cyst as reported by Goldstein (164, 165). Occasionally, it becomes infected and produces a perirenal cellulitis or abscess and, secondarily, cortical abscesses of the kidney. In 2 of our cases, it persisted to form a large cyst of the lower pole, and in 1 case degeneration occurred to form a large perirenal abscess.

Pain and tenderness in the affected costolumbar region and/or the upper quadrant anteriorly are usually present and were found in more than 85 per cent of our patients. They are directly proportional to the severity of the injury, but seem to bear no relation to the extent of the kidney damage produced. They may be due to trauma of the abdominal wall, fracture of the lower ribs, contusion of the soft parts, pull on the pedicle, and occasionally to clots in the ureter. An interesting finding which has often been noted but not stressed sufficiently is that outlined by Prather (105, 106), namely, pain and tenderness in the lower quadrant on the corresponding side of the injury in conjunction with psoas spasm, appearing from 12 to 36 hours after the injury, which are diagnostic of extravasation of blood and/or urine. They indicate true rupture of the kidney long before blood pressure or pyelographic changes makes one suspicious of such an eventuality. They were observed in 3 of our cases, and were of inestimable value in establishing an early diagnosis in each instance.

Peritoneal irritation. Nausea, vomiting, hiccough, and signs of paralytic ileus may be reflexly produced by the injured kidney. These may so dominate the picture within a few hours that the possibility of an abdominal injury is strongly entertained, especially in the cases in which there is an absence of hematuria. As a general rule, if the abdominal signs are reflexly produced, they tend to subside or disappear within a short time, whereas, if there is an actual intraperitoneal injury, they tend to persist and increase. Difficulty in differential diagnosis may be encountered in instances in which laceration of the peritoneum occurs in association with a kidney injury without any injury to an abdominal viscus, as was seen in one of our cases.

Suppression of urine. A variable diminution in the urinary output is usually noted. This is due to the temporary suppression of the injured kidney, to possible ureteral occlusion by blood clots, or to an injury to the ureter or pelvis on the affected side. Reflex suppression on the normal side has been reported and was seen in 2 of our cases. The urinary suppression, as a rule, subsides quickly and is soon followed by polyuria. A period of extended suppression may denote a severe injury to both kidneys, to one kidney with severe reflex suppression of the uninjured kidney, or an injury to the only good kidney that the patient possesses.

Associated injuries. An injury to the kidney may be associated with injury to other regions: namely, fracture of the last two ribs, fracture of the transverse processes of L 1, 2, 3, and 4 on the affected side, or contusion or rupture of the liver or spleen, or of both. Coincidental damage to the pancreas offers a grave prognosis, but the most serious of all is an injury to any part of the intestinal tract. Of injuries to the kidney and thorax, 40 per cent are associated with intrathoracic lesions(50). Fracture of the skull, concussion of the brain, and fractures of other bones of the body (including the pelvis) have also been found as associated injuries. Serious associated lesions were present in 19 cases and absent in 8 cases of our series. Their prevalence and wide distribution, and the fact that they are usually more serious than the kidney lesion itself illustrates how important they are in the course and management of renal trauma. Three of the 4 deaths were due to an associated lesion.

Coincidental findings.

1. If bleeding is profuse, or if there is an associated injury of the liver or spleen, there is a rapid fall of the red blood count and hemoglobin. Leucocytosis, which develops in a short time after the injury, subsides quite quickly unless extravasation is present and infection supervenes.

2. Some fever, usually low grade, is common soon after injury to the kidney in more than 50 per cent of the cases, unless shock is present. This soon subsides and may again appear about the fifth day because of resorption of blood from the retroperitoneal space. Sudden elevation or persistence denotes serious infective complications.

3. In some patients a secondary anemia out of all proportion to the degree of trauma or to the

amount of hemorrhage may appear on the fourth or fifth day (140). This is a toxic phenomenon and was observed in 6 patients in our series.

4. Bile in the urine and jaundice denote injury to the liver. Some degree of cyanosis may be observed in those patients who are in some degree of shock, or in those with an injury to the lung with hemothorax, pneumothorax, or both. Air hunger may be seen at times in patients who are bleeding profusely.

Diagnosis of Renal Injuries

The diagnosis of a renal injury in the majority of instances is relatively simple. A history of an accident, with or without external evidence of injury, pain and tenderness in the kidney area, and the finding of hematuria, more than suffices to warrant a diagnosis of trauma to the kidney. However, in some cases, even after a careful critical examination, one may not be able to make an exact clinical diagnosis. In these instances, the history of trauma may be trivial or absent and the external evidence of injury may be lacking. In addition, as I have previously outlined, the symptoms may be confusing or misleading, or vital subjective and objective findings may be missing. This is true especially in those cases in which we have associated visceral or bony injuries of such magnitude that the latter injuries are considered as of paramount importance and the kidney injury as trivial in nature. Equally disconcerting are those cases in which, for one reason or another, no blood is found in the urine. Backus recently reviewed 7 cases in which the presenting signs and symptoms were those of an acute abdomen. In all but 1 of these cases, the mistaken diagnosis had led to exploratory laparotomy with negative abdominal findings before the true underlying pathology of renal injury was realized. We have recently had such a case at Beekman-Downtown Hospital (Fig. 1), of a young man who after a fall on his buttocks in the bathtub apparently sustained a trivial kidney injury in that he had no distinctive loin tenderness and only from 10 to 15 red blood cells per high power field in the urine. The presenting symptoms were those of a ruptured intra-abdominal viscus. A simple abdominal film disclosed what was interpreted as free air under the diaphragm and he was explored by the surgeons with negative abdominal findings. Urological investigation later disclosed an intraparenchymal rupture of the upper calyx of the left kidney.

In a very small number of instances the renal injury is so extensive, or the associated injuries are of such magnitude, that the individual dies before or soon after he reaches the hospital. Fortunately, however, in the great majority of injuries to the kidney, the trauma sustained does not immediately threaten the life of the individual.

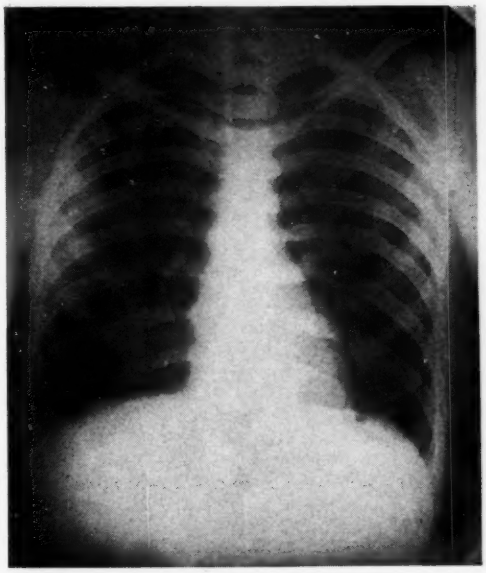
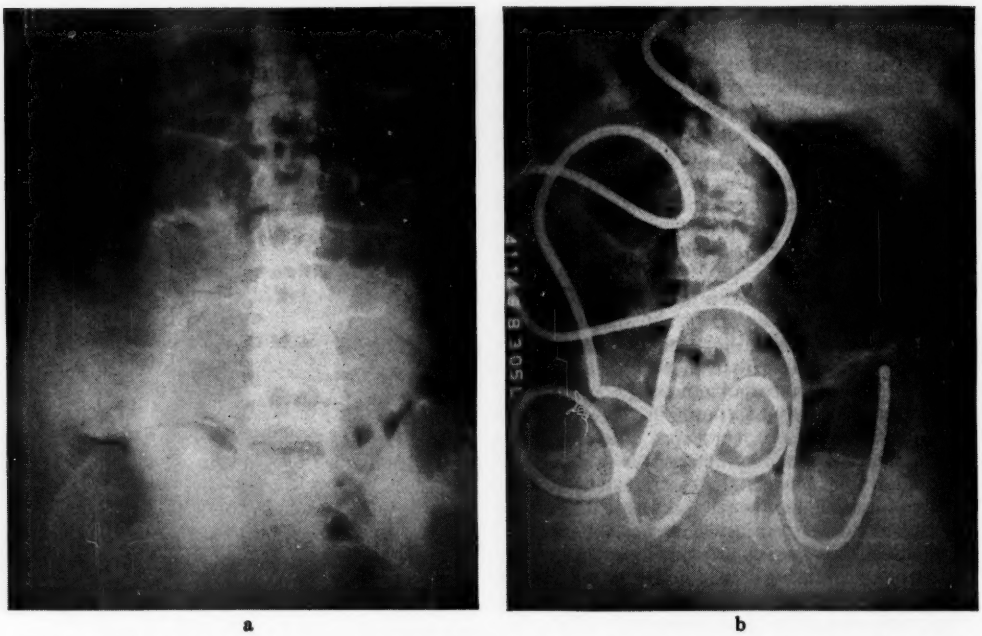


Fig. 1. Simple abdominal film interpreted as showing free air under the diaphragm in a patient admitted with abdominal rigidity after a fall on his buttocks. The exploratory laparotomy was negative. Urological investigation later disclosed an intraparenchymal rupture of the left kidney.

Following an injury that may in any way conceivably involve the genitourinary system, an immediate and complete physical examination should be made, with care to note whether any complicating associated injuries exist. It should be remembered that complicating injuries of the brain, abdominal viscera, and chest may be latent in manifesting themselves.

If there is hematuria, it is first necessary to rule out rupture of the urethra and bladder. Roentgenograms will disclose fracture of the pelvis. Ruptures of the urethra will soon make themselves evident locally. If the bladder is suspected, late films of the bladder in the excretory pyelograms will be of help, and may show intraperitoneal or extraperitoneal extravasation. Signs of fluid in the peritoneal cavity and of peritonitis should be carefully looked for. All patients should be made to void soon after admission and the urine carefully studied. Subsequent urines should also be examined. If the individual cannot void, he



a b

Fig. 2. Simple abdominal film in a case of rupture of the right kidney showing the gas that may be associated with a rapidly developing paralytic ileus. a, No information is discernible concerning the kidneys. b, Treatment with the Miller-Abbot tube.

should be gently catheterized to distinguish between inability to void due to the severe pain of the injury, urinary retention due to clots in the bladder, and a possible ruptured bladder or urethra. Six of our patients were catheterized because of inability to void and in each instance renal trauma was suspected after finding gross blood in the urine.

Since there is no relation between the intensity of the traumatism, the clinical signs, the symptomatology, and the gravity of the renal lesion, the patient should be investigated urologically as quickly and completely as is possible. It is only by this approach that a genuine anatomicopathologic diagnosis can be made, which is so necessary in the evaluation of conservative versus operative interference. The following methods have been proposed for urological investigation: (1) simple roentgenography, (2) excretion urography, and (3) cystoscopy and retrograde pyelography.

SIMPLE ROENTGENOGRAPHY

A simple film of the abdomen should be made soon after admission and may give an initial lead as to the injury. It may even be made while the patient is receiving treatment for shock. Under excellent circumstances, the following data may be discerned on the simple film (2, 55, 86, 115):

1. Absence of the renal shadow.
2. Enlargement of renal shadow due to subcapsular hematoma.
3. Obliteration of the psoas line.
4. Scoliosis of the spine with concavity toward affected side due to reflex muscular spasm.
5. Raised hemidiaphragm—found more often on the left side.
6. Extraperitoneal hematoma—large soft tissue mass of slightly greater density than remainder of the posterior abdominal wall.
7. Associated bony injuries: fracture of the eleventh and twelfth ribs, fracture of the bony pelvis, and injury of the lumbar transverse processes or vertebrae.
8. Air under diaphragm—representative of ruptured viscus.
9. Fluid levels in dilated loops of bowel.

However, except for the demonstration of a grossly enlarged kidney on the affected side, of air under the diaphragm, or of associated skeletal fractures, the simple film is disappointing and

Fig. 3. Excretory urography performed at the bedside using a portable x-ray unit. The patient had fallen down an elevator shaft and had sustained a fracture of the twelfth thoracic vertebra, and the left tenth and eleventh ribs. There was marked tenderness in the left loin. He was bleeding moderately from the urinary tract and he was in shock. Because of these normal pyelograms, the patient was treated conservatively.

Fig. 4. Trauma to the right kidney. Intravenous pyelograms demonstrate a dilated pelvis and ureter on this side with filling defects interpreted as blood clots. No evidence of extravasation. At operation there was a large rent bisecting the kidney in the region of the pelvis roofed by the blood clot.

does not, as a rule, supply valuable information (2, 22, 115). The film is usually not diagnostic because it is largely obscured by gas associated with a rapidly developing paralytic ileus (Fig. 2). In my experience, the simple film was of value in 13 cases in determining associated skeletal injuries. In my cases it was either misleading or not diagnostic as applied to the renal lesion. In instances of dire emergency, one may have recourse to a simple film, but, if at all possible, once the patient is out of shock, one should perform excretory urography. Certainly, if the exigency is such that emergency surgery is contemplated, it is imperative to at least take a simple film in order to attempt to demonstrate that another kidney shadow exists besides the traumatized one.

EXCRETION UROGRAPHY

Excretory urography has been recommended by many but employed by too few people as a routine procedure in every case of potential renal injury. Storck has re-emphasized its value and has pleaded for its wider use, even at the bedside if the patient cannot be moved (Fig. 3). Intravenous pyelography is simple of execution, free of potential infection, and may give valuable information if properly interpreted.

Although the optimal time for doing an intravenous pyelogram should be determined for each patient, it would appear from the reported experimental and clinical evidence that the best pyelograms are obtained immediately after the injury (149). Stirling and Lands (142) were able to make a positive diagnosis from initial pyelograms in 23 of 34 cases, while Ferrier and Knigge were able to make a conclusive diagnosis in 44 of 53 (82%) severly injured cases. Similar experiences are reported by Hareide, Wood (164, 165), and Schenck. McKenna has reported several cases of rupture diagnosed by excretory urography and confirmed by operation. Prather (105) has described instances of lack of function soon after admission, but function became evident in from 5 to 7 days. It would appear from this that if the initial pyelogram shows no excretion or if it is unsatisfactory, it should be repeated within a

few days. Most men do not advise excretory urography if the patient is in shock, or if the blood pressure is below 90 mm. systolic. The decided value of intravenous pyelography even in such circumstances is illustrated by a case of William Ginzberg. This patient was a female who had suffered a severe injury in an automobile accident. On admission to the hospital, she was in shock with a blood pressure of 78 mm. Hg, and she was bleeding profusely. X-rays revealed a large soft tissue mass on the injured left side with a nonfunctioning kidney and a perfectly functioning right kidney. Nephrectomy was done with a great deal of assurance that the patient's remaining kidney was perfectly normal. The following information may occasionally be gathered from excretory urography (53, 86):

Injured side.

1. Normal or relatively normal pyelogram—minor injury
2. Diminution or absence of excretion on affected side:
   poor shadow or absence of dye due to
   a. Actual renal damage
   b. Pressure of extrarenal hematoma
   c. Reflex from shock
   d. Too long a delay in obtaining pyelograms
3. Deformity of pelvis or calyces due to actual destruction or blood clot.
4. Extravasation of the dye
   a. Within the kidney parenchyma
   b. Outside the renal capsule
5. Displacement of ureter, ureteropelvic junction, or both

Noninjured side. The presence and function of the opposite kidney. Turton and Williamson have reviewed 5 cases in which trauma was sustained by a congenital solitary kidney, and in 4 of these nephrectomy was unwittingly performed. Although congenital solitary kidney is not frequent, congenital hypoplastic kidney occurs frequently enough to make one extremely careful before doing a nephrectomy for renal injury without having demonstrated a normal kidney on the contralateral side (135). Although some hypoplastic kidneys may sustain life, the majority will not.

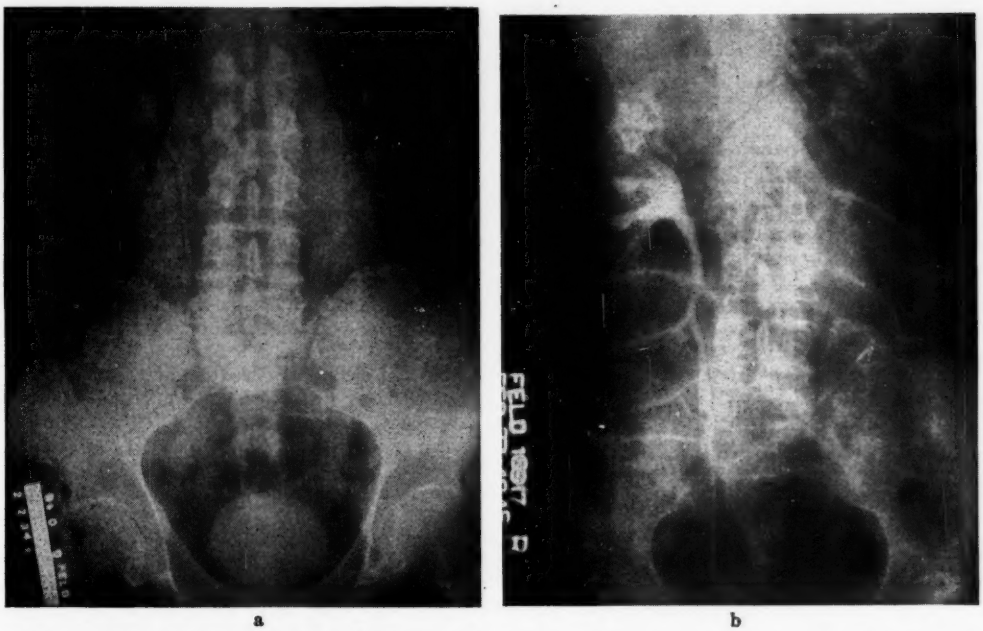
From the foregoing, it can be seen that excretory urography is of great diagnostic value immediately following renal injuries. Its immediate usefulness is found in the cases in which the injury is minor or moderate and in which the secretory power is not disturbed. If the ruptured kidney is damaged to such an extent that its secretory power is reduced or abolished, the pyelograms will be of little value except perhaps to demonstrate a good contralateral kidney. If a ruptured kidney with multiple fractures and a large perirenal hematoma is excreting the dye, the extravasated urine is mixed with the media and can be demonstrated only with great difficulty. Further, in severe renal injuries, by the time the patient has recovered from shock and sufficient urinary output is present to warrant utilization of excretory urography, intractable ileus and abdominal distention supervenes to further obscure the films.

The experimental findings of Stirling and Lands (142), and of Domrich, that excretory urography aids in locating the side involved and the gravity of the lesion, but that it does not reveal the extent or type of injury, has been confirmed by clinical experience. Hamilton Bailey states that in his experience he has had disappointing results with excretory urography in assessing kidney damage on the affected side. This has been reiterated by McGrigor, Adams, Sargent (122), Foulds and Shannon, Farman, Gordon-Taylor, Scholl (127), Mathe (82), and others.

In one of my first cases of renal trauma, excretory urography revealed a dilated pelvis and ureter filled with blood clots, with no evidence of extravasation (Fig. 4). The patient was treated conservatively for 2 weeks, at the end of which time operative interference was undertaken because of persistent and increasing hemorrhage. Nephrectomy was performed but the patient died soon after operation. The specimen showed a large rent roofed by blood clot, almost bisecting the kidney in the region of the pelvis. I feel quite certain that had a retrograde pyelogram been done in this case, extravasation would have been demonstrated, and operative interference undertaken much earlier, thereby perhaps saving this man's life. Excretory urography gave me a false sense of security in this case which was not justified by the existing pathology.

In another case excretory urography disclosed an intraparenchymal rupture, and the patient was treated conservatively, the hematuria ceasing on the third day. Ten days later he had a sudden profuse secondary hemorrhage warranting operative interference. This disclosed a large rent in the upper pole, and nephrectomy was performed with good result. Here too, I feel that if retrograde study had been done, the patient would have been operated upon sooner.

In some of my cases, as illustrated in Figure 5, the excretory pyelogram of the injured kidney may appear normal, but retrograde study of the traumatized organ may demonstrate extravasa-



a b

Fig. 5. Trauma to the right kidney. a, Intravenous pyelograms demonstrate normal right pyelogram. b, Retrograde pyelogram on this side indicative of extravasation. At operation, a ruptured hypernephroma of the upper pole was found.

tion. On several occasions, I have found no excretion of the contrast substance to be present on the injured side, but on retrograde pyelography, I had a perfectly good pyelogram demonstrative of either a normal pelvis or unmistakable evidence of extravasation.

In addition, observation cystoscopy at the time of the retrograde study may also be helpful in visualizing the interior of the bladder, in studying the ureteral efflux and indigo carmine excretion of both kidneys, and in unplugging a ureter filled with blood clot. Two cases in my experience illustrate this point strikingly. One was that of a patient admitted to Beekman-Downtown Hospital whose foot was caught by a tow rope while working on a ship; he was thrown to the floor striking his left loin and sustaining a fracture dislocation of his ankle. Because of the left loin pain and hematuria, excretory urography was performed. This revealed a normal right pyelogram and an unsatisfactory but apparently normal left pyelogram, and he was treated conservatively. However, because of persistent and profuse hematuria with clots which lasted longer than 24 hours, he was examined with the cystoscope. This revealed a large ulcerated bleeding bladder carcinoma which was immediately fulgurated. The left ureteral efflux was only slightly blood-tinged, and the left pyelogram was fairly normal. His further urological progress was uneventful. Another case was that of a man whose right loin was struck by a log flying off a sawmill. He was admitted in shock, bleeding profusely, and was given supportive therapy. When he had recovered sufficiently, excretory urography was performed. This revealed a normal pyelogram on the right side with no evidence of extravasation; there was no excretion from the left side. Because of his persistent and profuse bleeding, he was examined with the cystoscope on the following day; this revealed the bleeding to be coming from the right side, and careful inspection of the bladder showed no left half of the trigone and no left ureteral orifice. It was quite evident that we were dealing with a traumatized congenital solitary kidney. Although the condition improved with conservative treatment, the knowledge obtained by cystoscopy would have been of inestimable value had surgical intervention been necessary.

Because of this accumulative experience and evidence, I now strongly agree with Sargent (122, 123) and Farman that cystoscopy and retrograde

TABLE I.—REPORTED MORTALITIES IN RENAL TRAUMA (IN PERCENTAGES), FROM 1896 TO 1937

Author	Year	Collected cases	Expectant treatment	Conservative surgery	Nephrectomy	Total mortalities
Kuster	1896	—	—	—	—	47.0
Riese	1903	490	21.1	4.7	17.9	18.9
Watson	1903	562	29.0	Without complication	18.3	
				With complication	44.0	30.4
Suter	1905	701	20.6	14.6	16.7	17.3
Keller	—	478	22.0	—	—	22.0
Guterbock	—	13	—	—	30.7	30.7
Willis	—	14	—	—	55.5	55.5
Gravitz	—	108	—	—	—	46.2
Lardennois	1908	767	20.0	28.0	18.0	22.0
Pononarff	1914	123	9.0	—	—	—
Bugbee	1916	8	0.0	0.0	0.0	0.0
Delzell	1928	11	14.3	33.3	—	18.1
Osgood	1929	52	29.5	55.5	—	34.6
Beach	1930	10	25.0	—	—	10.0
Floyd	1932	6	0.0	0.0	0.0	0.0
Simpson	1933	9	0.0	0.0	0.0	0.0
Pratt	1934	21	9.9	25.0	12.5	14.3
Schenck	1934	42	26.8	16.6	20.0	23.8
Sweetser	1935	12	0.0	40.0	0.0	16.6
Herman	1936	85	12.2	36.3	—	24.2
Jones	1936	4	0.0	0.0	0.0	0.0
Wood	1937	25	8.0	18.0	—	12.0
Bottone	1937	85	12.0	36.0	—	15.3

pyelography should be routine as this gives a much better pyelogram and demonstrates extravasation, when present, much more assuredly and definitely than excretory urography. Although excretory urography was done 20 times in this series of 27 cases, satisfactory pyelograms for diagnosis were obtained in only 6. Extravasation was demonstrated in only 1 instance, and missed in 5 cases. Two of the latter cases were diagnosed at operation, and 3 by retrograde study. In another instance, extravasation which was suspected as being present on the intravenous pyelograms was not confirmed on the retrograde. Cystoscopy also occasionally gives us valuable information concerning concomitant lesions in the bladder.

The argument against retrograde pyelography has concerned itself with the danger of introducing infection and increasing or reactivating bleeding. Redi, Guterriez and Farman (45) believe that this is more theoretical than actual. That the retrograde dye acts as an irritant on the traumatized renal parenchyma has been disproved by Campbell and Lynch. In answer to the statement that retrograde pyelography may disseminate infection, I can only state that most urologists believe that if there is extravasation of blood, urine, or of both, infection may supervene without retrograde injection of the contrast substance. In a careful review of the literature, I have been able to find only 1 instance of increased bleeding following retrograde catheterization. This was a case of Peacock's, but in this case also it must be remembered that secondary bleeding might have arisen even without cystoscopic manipulation. In my experience, I have not encountered a single instance of aggravation of the general signs or increase of the hemorrhage or the size of the hematoma. This procedure has been of inestimable value in the instances in which I used it, and it might have saved the only patient who should not have died in this series, had I used it. However, I wish to caution that if retrograde study is performed, it be done under strict aseptic technique, and that the dye be instilled by the gravity method as recommended by Wesson.

If we admit the possible hazards of retrograde pyelography, their sum total does not equal the danger of case management without it. The only reliable and scientific basis for an anatomicopathological diagnosis as to the type and extent of the injury is by retrograde study, so necessary in the evaluation of conservative or operative intervention.

Mortality and Complications

A study of Table I in which mortality statistics have been collected up to the year of 1937 suggests that the mortality in renal trauma, whatever the treatment, is high, averaging over 20 per cent.

In the larger series of collected statistics, as reported by Riese, Watson, Suter, Lardennois, Keller, Ponomarett, and Osgood, the mortality figures would seem to favor operative interference as against expectant treatment. These early statistical reports, still quoted by recent textbooks and writers, are in some measure valueless and misleading as applied to the present-day management of renal injuries. In the years from 1938 to 1948 (Table II), there has been a decided decrease in the death rate from renal trauma.

There was no mortality reported by Mertz, Priestley, Harrison, Cheetham, and Adams, for patients treated expectantly or by operation. A

review of the reports of Prather (106), Robertson (115), Ferrier, Lynch, and Orkin reveals that the total mortality in their series varies from 11 to 27 per cent. If one eliminates from consideration the patients who enter the hospital in a moribund condition or with very severe associated injuries, the mortality rate drops to about 4 per cent.

The reasons for this marked reduction in mortality are not difficult to find according to Scholl (127). Modern accurate diagnostic measures, a better knowledge of the pathology resulting from renal trauma, a clearer understanding of the criteria for surgical intervention, blood banks and the more generous use of available blood, skillful conserving parenchymal plastic procedures, and efficacious, widely used antibiotics have all served to improve the prognosis. On the other hand, despite all of these influences, the mortality will always tend to be high in certain types of cases. One type includes those instances in which the patient is exsanguinated and moribund on admission because of either pulpification or severe rupture of the kidney. Schenck and Osgood had 4 such cases in their series. The mortality will always be high in complicated cases. Laewen, quoted by Strauss (145), reported a series of 57 cases of gunshot wounds; there were only 5 cures, a mortality of 87.7 per cent. The results of Wallace, Lockwood and his coworkers, Fraser and Drummond, and Walters and his associates published in 1917 and later reviewed by Young for the Surgeon General's report, covered a series of 2,121 cases of gunshot wounds of the abdomen. The kidney was involved in 155 instances, and there was a mortality of 57 per cent. There were 13 cases of stab and gunshot wounds of the kidney with 6 deaths due to intra-abdominal involvement in Ferrier and Knigge's series. The association of a ruptured liver or intestines and a ruptured kidney carries with it a mortality of from 50 to 72 per cent. Desjacques reported a 50 per cent mortality for coincidental injuries of the spleen and kidney. In addition to intra-abdominal involvement, one may encounter severe general or skeletal injuries. Ferrier and Knigge had 31 such cases, and in our series 2 patients died with minor renal lesions—one with a gas bacillus infection of a traumatic amputation of the leg, and the other with a severe injury to the chest and shift of the mediastinum.

In Table II, in which there is reported the mortalities of the period from 1938 to 1948, I have marked the mortalities with a superior number 1 in the instances in which I felt that severe associated complicating injuries were of such magnitude as to alter the mortality greatly. In most of these, the renal injury was of minor consequence and the complicating injury was undoubtedly the cause of death. For example, Prather (105) observed the immediate death of 2 patients within 4 hours of injury before shock could be terminated to permit surgical intervention. One of his operative patients died from laceration of the liver and peritonitis. There were 4 deaths in Robertson's series (115), 2 operative and 2 nonoperative. The 2 nonoperative deaths followed gunshot wounds, one injuring the lung, spinal cord, and kidney, and the other injuring the kidney, abdominal viscera, and lung. The operative deaths were due to anuria and a fractured kidney, respectively. In the total series of 137 cases reported by Ferrier and Knigge, there were 37 deaths, a mortality of 27 per cent. In their series, the kidney injury was named as the cause of death in only 5 of the 31 cases of severe general injuries. If we consider merely these 5 cases, it leaves 5 instances in a total of 111 cases, a mortality of 4.5 per cent. In our series of 27 patients, there were 4 deaths, 2 operative and 2 nonoperative. Of the operative deaths, 1 occurred in a case of ruptured liver, spleen, bladder, and urethra in addition to the kidney injury. Of the nonoperative deaths, one was of a patient with a gas bacillus infection resulting from traumatic amputation of the leg, and the other was of a

TABLE II.—REPORTED MORTALITIES IN RENAL TRAUMA (IN PERCENTAGES), FROM 1938 TO 1948

Author	Year	Collected cases	Expectant treatment	Conservative surgery	Nephrectomy	Total Mortalities
Droschl and Fink	1938	45	0.0	0		0.0
Mertz	1938	5	0.0	0.0	0.0	0.0
Kindall	1938	10	0.0	0.0	0.0	0.0
Priestly	1938	45	0.0	0.0	0.0	0.0
Farman	1939	3			33⅓	33⅓
Harrison	1940	27	0.0	0.0	0.0	0.0
Peacock	1940	26	5.2	0.0	50.0	11.5
Prather	1940	20	14.2[1]	33.3[1]		20.0[1]
Cheetham	1941	43	0.0	0.0	0.0	0.0
Shure	1941	9	0.0			0.0
Robertson	1942	26	10.0	50.0[1]	0.0	15.3
Adams	1943	7	0.0	0.0	0.0	0.0
Ferrier	1943	137	20.5[1]	34.0[1]		27.0[1]
Culp	1947	48	0.0	3.0	0.0	2.0
Lynch	1948	23	12.5[1]	0.0	25.0	13.0
Orkin	1948	27	12.5[1]	25.0[1]	20.0	14.8[1]

[1]Severe associated lesions.

patient with a ruptured lung and shift of the mediastinum. The renal injury was of a minor degree in each of these cases. If we consider only 1 of the operative deaths as uncomplicated, leaving out the 3 in which the associated lesion was responsible for the individual's demise, we have 1 death in 24, a mortality of 4.1 per cent.

Although in the last 10 years there has been a decided decrease in the death rate due to trauma of the kidney, numerous men have pointed out the occurrence of an astoundingly large group of complications as an aftermath of such injury. These serious after effects, which often require nephrectomy for their cure, usually occur in the patients with ruptured kidney who have been treated expectantly. Cheetham saw 25 patients with late complications at various intervals after the trauma. Three could be treated medically and 22 had to be operated upon. Dozsa (38) reported 82 cases of injury to the kidney. Operation was performed in 3, and conservative management was satisfactory in 79. Twenty-seven of the patients, seen from 6 months to 30 years after the injury, had to be operated upon for consequences of the renal injury. In Priestley and Pilcher's series (109) of 45 patients treated medically, 25 per cent had symptoms referable to their injury. Colston and Baker (23) presented 13 cases which came under their personal observation at periods varying from 4 months to some 30 years after the trauma, among which they found cyst formation in 6. These authors state that while it is not their purpose to condemn conservative treatment of kidney injuries, they believe that the surgeon must be completely familiar with the changes which may occur in the kidney or perirenal tissue as a late result of the injuries and that he should take the proper steps to prevent their development. In our series of 27 patients, there were 6 with a ruptured kidney who were treated expectantly. Follow up after 5 years revealed that the result is poor in all. In 2, a large cyst is present at the lower pole of the kidney, and in 4, kidney function as determined by excretory urography and indigo carmine excretion is shown to be reduced to 25 per cent or less of normal.

Obstruction at the ureteropelvic junction by stricture, band, or adhesions due to a more or less complete division of the ureter in this region or to a periureteral inflammatory reaction often leads to hydronephrosis or pyonephrosis (26, 42, 57). An acute perinephritic abscess may develop in the course of breakdown of a hematoma, or localized necrosis of the kidney (26, 57). In the chronic form, following degeneration of the hematoma, there may be the formation of a perirenal collection of fluid between the fibrous capsule and the kidney or in the fatty capsule, with the formation of perirenal cysts or pseudohydronephrosis (144) (Fig. 6).

Fibrous perinephritic changes may produce some degree of compression and atrophy of the kidney with resultant chronic pain (29). Persistent pain may also result from involvement of nerves in scar tissue. Although Cabot (16) doubts the possibility of nephroptosis, O'Conor found 12 instances of this condition which could be classified as being definitely post-traumatic. Lazarus reported a case of renal calculus developing 13 weeks after an injury. Sklarz and Cabot (16) report post-traumatic calculi around a coagulum (Fig. 7). Kindall had several cases in which the renal calculus was in close proximity to the renal scar. Interference with the blood supply may produce atrophy of the kidney. Some people have supposed that the vascular damage incident to the trauma may conceivably produce a partial ischemia and hypertension (91, 148). This has not been universally accepted as Braasch, in a review of 50 cases with clinical evidence of renal trauma, found that in only 1 instance was renal injury a possible factor in the causation of the hypertension.

Instances of renal tumor following injury have been cited by Bonar and others, but this also is difficult to evaluate. Other late complications that have been mentioned are persistent urinary fistula and secondary bleeding subsequent to conservative surgical interference.

The more widespread use of excretory and retrograde pyelography has served to unearth the ever-increasing number of complications. In addition, these procedures have brought out the fact that although the ruptured kidney may heal without any of these after effects, a definite and marked diminution in its function may occur. Wesson (156) believes that subcutaneous ruptures of the kidney may heal without operation and with a functional loss of about 50 per cent. The late results in several of my cases have shown that this functional loss may be even greater than that predicated by Wesson.

In contradistinction to the aforementioned complications that may follow renal ruptures treated expectantly, I have been impressed with the end result, as have others who have advocated conservative surgery in these cases. The freedom from symptoms and the excellent functional picture as determined by roentgenography and function tests justify in my mind a continuation of this plan of treating true rupture of the kidney (Figs. 8 and 9).

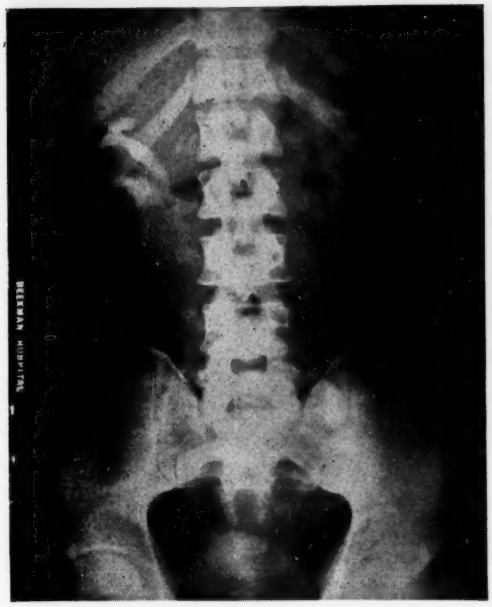


Fig. 6. Injury to right kidney 5 years before at which time a rupture of the kidney with a large hematoma was found. The patient was treated conservatively. At the present time, intravenous pyelograms demonstrate a distorted picture with a large cyst of the lower pole on the right side.

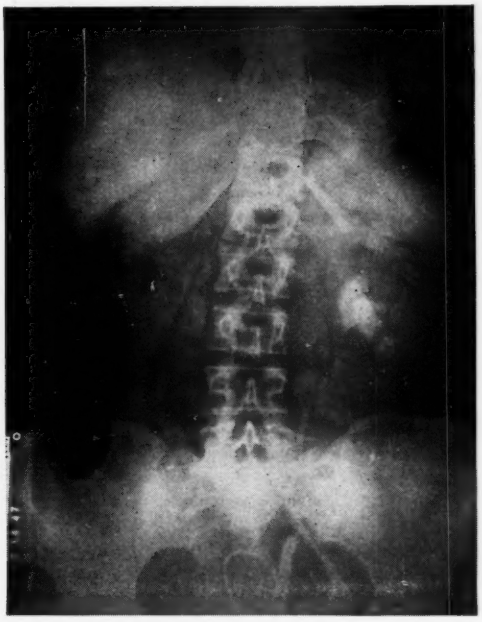


Fig. 7. Injury to left kidney 4 years ago. Intravenous pyelograms demonstrated a large calculus with no function in the left kidney. Retrograde study revealed a distorted upper ureter and a large calculus in the kidney with no excretion of indigo carmine from this side. At operation, the upper ureter was severely strictured. The calculus on chemical analysis contained a blood clot as its nidus.

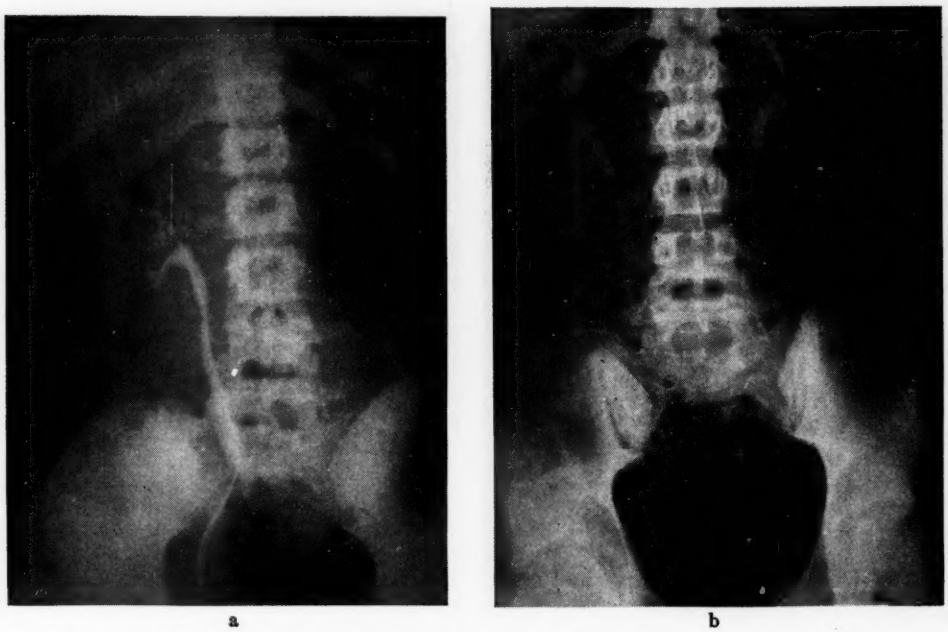
Treatment of Renal Injuries

The implication in the more recent literature concerning the treatment of renal injuries has been that the majority of deaths are due, on the one hand to the severity of the primary injury, and on the other, to procrastination in exploration. Since there are two general groups of cases, namely, those complicated by other injuries, and those with renal injury alone, and since each group may vary in severity, it is immediately evident how difficult it is to be dogmatic or to establish any standard rule in the management of renal trauma. While every case must be considered individually, it seems to me that in order to attain a successful end result in any patient, the following factors must be considered in every instance of renal trauma:

1. Prompt recognition of any intra-abdominal trauma or other associated lesions
2. The magnitude of the renal injury
3. Prompt decision if operation is necessary
4. The correct time for, and the type of, operative interference

In addition, if one keeps in mind the necessity of stopping hemorrhage early and of combating infection later on, a correct decision concerning management will more often be made than not.

In some cases, the injury to the kidney is so extensive, or the associated lesions are of such magnitude (or both) that death occurs almost immediately. Patients who sustain a laceration of the renal vessels succumb before or soon after they are admitted to the hospital. Fortunately, immediate exitus does not occur in the majority of instances of extensive injury to the kidney or associated lesions (or both), and the patients, as a rule, are admitted to the hospital in shock. The latter is due to the pain of the trauma, the severe injury, and the loss of blood, and should be combated with all available means—external heat, intravenous fluids, plasma, and blood. Morphia should be withheld until a careful evaluation of the abdominal findings have been made. Estes has recommended that the treatment of shock be carried out close to the operating room in order to have as



a b

Fig. 8. a, Retrograde study showing intraparenchymal rupture with extravasation in the right kidney. b, Postoperative result following suture of the laceration and drainage of the loin.

little delay as possible in inaugurating operative interference, if necessary, when the general condition permits. During the treatment of the shock, a variable period of time is available for the accumulation of evidence as to the extent and damage of the injury. Of primary importance is the determination of coincidental involvement of other organs. Injuries of solid viscera do not warrant immediate surgery unless there is evidence of marked intraperitoneal bleeding. Lesions of hollow viscera demand operative interference within 6 hours of the injury. Gunshot wounds should be treated conservatively unless there is evidence of marked bleeding or peritoneal irritation. Large open wounds of the chest warrant early exploration, while small ones may be safely watched.

A simple abdominal film should be taken as soon as possible in order to determine whether or not there is free air under the diaphragm and whether there are associated bony injuries. It is also of help in obtaining a rough lead as to the renal lesion, and in addition reveals two kidney shadows when possible. As soon as the patient rallies from shock, if the general condition permits and if immediate operative interference is not indicated, excretory urography should be performed. In some instances, if the patient does not rally from shock, intravenous pyelography may be of great value, as illustrated by Ginsberg's case and by 1 case of my own, in both of which excretion of the contrast substance was obtained.

The group of cases with complicating visceral injuries taxes the combined judgment and skill of the emergency surgeon and urologist. Although it has often been said that no patient in shock should be operated upon, many of these patients may never adequately come out of shock. Prompt surgery and multiple transfusions are our only hope in such instances. If operation is deemed immediately necessary, the manner of approach is usually decided by the relative severity of the signs and symptoms pointing to injury of the kidney and those pointing to associated lesions. Thus, if the intra-abdominal signs are more imperative, a laparotomy will usually be performed, in the course of which the injured renal area can be palpated. This may yield some information, but in many cases this is unsatisfactory as the field is obscured by the perirenal bleeding, and it is often difficult to determine the extent of the renal damage even if the posterior parietal peritoneum over the kidney is laid open. Also unsatisfactory is the

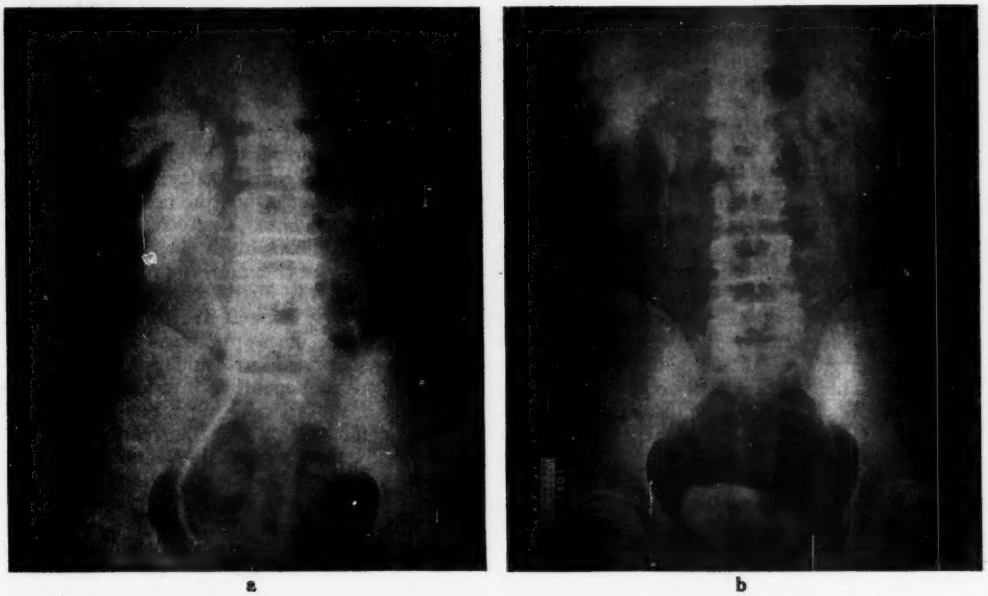


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Fig. 9. Case of spontaneous rupture of the upper ureter. a, Retrograde study showing extensive extravasation. b, Postoperative result following incision and drainage of the loin with pyelostomy and splinting ureteral catheter.

intraabdominal palpation of the noninjured loin to determine if another kidney exists. This procedure, however, is important and should be done in those instances in which neither a simple film nor an excretory pyelogram could be performed. Transabdominal nephrectomy is not advised as a poorly drained and readily contaminated field is opened up. The accompanying mortality is unusually high, so that if in the judgment of the surgeon the renal injury is not severe, the renal exploration should be postponed for several days until the patient is in better condition. If the renal injury appears to be severe, the kidney should be explored at once through a separate loin incision. Experience has shown, however, that operations in the kidney region immediately following laparotomy are usually productive of great and often fatal shock. If there is reason to believe that the kidney has been severely injured, it is much better to make a lumbar incision first. This permits of the evacuation of clots, offers more adequate visualization of the kidney lesion, and opens an easily drained region. Following the kidney exploration and surgery, the lower angle of the loin incision should be elongated transversely and the peritoneum opened in the anterior part of the incision, which will easily permit examination of the colon and viscera. Should any condition necessitating operative procedure be found intraabdominally, operation can be carried out by continuing the incision transversely and joining it with a vertical rectus incision. This procedure makes it unnecessary to change the patient's position or to make another incision, and impresses me as being the safest and least shocking method.

Once the patient is out of shock and his immediate existence is no longer threatened, I believe that every attempt should be made to establish an anatomicopathological diagnosis of the renal lesion. In every case an excretory pyelogram should be done. If the general condition is such that the individual cannot be moved, these pyelograms may be done at the bedside with a portable x-ray unit. This procedure was of inestimable value in one of my cases. Retrograde study has been advised by many men for only those cases in which the clinical picture does not improve. Of vital importance in the consideration of a satisfactory clinical improvement are:

1. Persistent and/or profuse hematuria
2. Increase in the size of the loin mass
3. Pain in the lower quadrant with signs of psoas spasm
4. Increase in severity of the abdominal signs
5. Signs of sepsis

For reasons previously enumerated, I agree with Sargent (124) that cystoscopy and retrograde pyelography should be routine in every case of renal injury and should be done wherever feasible as soon as possible.

In the management of patients in whom the kidney only is involved, there is one important question: whether to intervene surgically or to treat the patient expectantly. This has met with divergent opinions. One group (2, 12, 98) has believed that the treatment should always be conservative unless absolute indications for operative interference arises. Another group headed by Lowsley (75) believes that it is conservative to explore if the hematuria lasts longer than 24 hours. Still another group is of the opinion that in view of the possible dangers and sequelae following renal injuries and the slight risk of exploration, surgical interference should be early and frequent rather than late and rare (23, 165). The adherents of the last two opinions state further that the proponents of conservative treatment should realize that surgical interference does not imply nephrectomy, but an attempt to conserve the kidney by drainage and arrest of bleeding. Early exposure enables one to inspect the kidney and make the necessary repairs, to practice conservative surgery and prevent secondary complications, and to perform a primary nephrectomy when indicated (165).

The indications for immediate or emergent operation are determined entirely by the clinical picture of grave hemorrhage and/or signs of an associated intra-abdominal lesion. The indications for delayed surgical interference have never been universally agreed upon and seem to have been limited to those cases in which the clinical picture as described does not improve. I believe that pyelographic evidence of extravasation should determine the need and should be the basis for delayed surgical interference before any deterioration in the clinical picture makes such intervention necessary. I again wish to reiterate that from my experience and that of others, I believe that retrograde pyelography is the only absolute method of establishing an anatomicopathologic diagnosis so necessary in the further management of these cases. By this method it is possible to decide what type of injury has been sustained, and one can institute the necessary treatment with reasonable assurance and avoidance of possible sequelae.

Statistically, contusion of the kidney (Type 1 and 2 injuries) makes up about two-thirds of all renal injuries, and true rupture (Types 3 and 4) about one-third. It is universally agreed that if the diagnosis has been definitely established as that of a contusion, the patient should be treated conservatively and kept in bed at least 2 weeks (94). O'Conor and Adams have presented cases in which there was a recurrence of bleeding in patients gotten out of bed too soon. One of my patients with an intraparenchymal rupture of the kidney stopped bleeding 5 days after his injury and on getting out of bed the next day began to bleed so profusely that emergency nephrectomy had to be performed. In the conservatively treated contused kidney, clinical improvement is usually noted and the further course is uneventful. If, as may rarely happen, the primary or secondary bleeding becomes profuse and uncontrollable, or if sepsis supervenes, re-evaluation of the condition and possible operative interference becomes necessary.

The opinions concerning the treatment of true rupture of the kidney (Types 3 and 4) are very divergent. One group feels that this type of case should be treated conservatively unless persistent and profuse hemorrhage warrants operative intervention. It is of the opinion that if nephrectomy becomes necessary, it may be done at a later date. Another group feels that this type of injury should be subjected to operative interference. The experimental findings of Stirling and Lands (140), and the clinical experience as cited by Wood (165) and Prather (106) stress the fact that while true rupture may at times heal without complication, this is the exception rather than the rule. The feeling would seem to be that earlier surgery may result in greater conservation of renal tissue with no increase in loss of life. To be more specific, too long delayed surgery in evident rupture may result in irreparable infection and necessitate nephrectomy, while comparatively early surgery, after the period of shock is past, should decrease our mortalities and nephrectomies. In accordance with my experience, I subscribe to this view wholeheartedly.

The time to operate has to be determined for each case. If it is done too early, the result may be fatal. If, however, in the face of alarming bleeding, one procrastinates, hemorrhage and shock may occur. In the absence of a peritoneal tear or injury of an intraperitoneal viscus, the emergency of a ruptured kidney seldom demands immediate operative interference. Wood (165) believes that exploration is more easily and safely carried out 3 or 4 days after the injury. If the patient is operated upon too early, he may bleed profusely and fatally once the clots are evacuated. This delay in time allows the small vessels to seal and the clots to organize. It also permits im-

provement in the patient's general condition by the administration of blood and other aids. Further, opportunity is afforded during this recovery period for an evaluation of the clinical and roentgenographic findings, and operative intervention can be done with a greater feeling of assurance. In addition, if infarction of part or all of the kidney occurs, this will be visible to the surgeon at the end of 72 hours.

In the treatment of wounds of the kidney there are three possible surgical procedures according to Scholl (8, 9, 127): (1) drainage of the renal region with or without decapsulation, (2) partial nephrectomy and repair, and (3) nephrectomy.

1. *Drainage of the renal region.* This is the simplest procedure and may be done quickly with minimal risk to the patient. It is indicated in those conditions in which time or the condition of the patient contraindicates extensive surgery, and in those instances in which a good contralateral kidney cannot be demonstrated. Foreign bodies and loose fragments of tissue should be searched for and removed. Drainage should be free and adequate by means of many Penrose drains. The use of tampons, although condemned by Wesson (156) as it may lead to sinus formation, may in selected cases be lifesaving. A large infected perirenal mass may be drained to improve the patient's general condition before nephrectomy. In some of these cases, further treatment may later be found to be unnecessary as satisfactory healing and progress may take place. In others, subsequent nephrectomy may have to be done, but with much less risk. If hemorrhage is encountered, every effort should be made to control it. Sutures of fine chromic catgut tied over fat may be used, or repair with ribbon gut according to the method of Lowsley (74, 75) may be employed. Oxycel or gelfoam may be placed over bleeding points or on the suture line. Kindall has reported a case of rupture of the kidney from the pelvis through the entire parenchyma which he repaired with complete functional recovery. Usually complete hemostasis cannot be obtained as one often encounters a continuous ooze in the field. Exposure through the loin permits firm packing, and this can be done with plain gauze. It is advisable to place a rubber dam under the packing as in this way the packing can easily be removed and there is no danger of secondary hemorrhage following such removal. If nephrectomy is contemplated but cannot be done because of either a deep short pedicle or a precarious condition of the patient, the area may be packed until such a time as secondary nephrectomy may safely be undertaken. If drainage is instituted, it should be continued for at least 10 days. In some instances of severe parenchymatous infection or extravasation under the capsule, decapsulation may be performed. This relieves pain and tends to minimize any resultant cicatrization. Decapsulation may also be done in post-traumatic hydrocele of the kidney, such as was performed in one of my cases with complete relief of symptoms.

Mention should be made of the patient who has had a severe rupture of the kidney with a large perirenal hematoma upon whom operation cannot be performed either because of severe shock or severe associated lesions such as a fractured skull, laceration of the brain, ruptured lung, and the like. In the typical case, the patient has had a stormy course and has bordered on shock because of one or both of these conditions for a week or longer. At the end of this period, when the patient is no longer in shock and appears to be on the upgrade, surgical interference may be contemplated in an attempt to evacuate a large hematoma in the loin which may or may not be infected. Experience has shown that in this type of case, operation is fraught with grave risks. The patient may go into shock again, complete evacuation of the hematoma and blood clots is difficult, and drainage is almost impossible as the entire retroperitoneal area is involved. Indeed, some of the areas may pocket off, and become reinfected. In some of these instances, a patient who seems to have weathered the storm with expectant treatment, may, with operative incision and drainage, and evacuation of the clots, be converted to a severely infected individual who rapidly becomes exhausted. It is my feeling that in this type of case, one might leave well enough alone and chance the risk of post-traumatic renal sequelae.

2. *Partial nephrectomy and repair.* Even under ideal conditions, partial nephrectomy and plastic repair may be unsuccessful. Cases have been reported in which the lower pole of the kidney was knocked off and mattress sutures tied over fat were used to close the defect and arrest the bleeding, in which a satisfactory functioning hemikidney was obtained. As a general rule, this procedure is not recommended for various reasons. It is difficult and time-consuming, and carries with it very little likelihood of success in an infected wound. Extensive plastic procedures on the pelvis or upper ureter may produce a functionless kidney, and necrosis and late bleeding may necessitate a secondary nephrectomy. Also, partial nephrectomy is not likely to remove the cause of the bleeding in a patient already depleted. It would seem to be poor judgment to expose him to a fresh hemorrhage from suture.

If the ureteropelvic junction is partially torn, repair over a splinting catheter with nephrostomy drainage might be successful. If the lower pole of a solitary kidney has been avulsed, closure of the defect and control of the hemorrhage with mattress sutures tied over fat becomes imperative.

3. *Nephrectomy* is simpler than most conservative operations. It removes the cause of bleeding and the potential field for infection. It is also less time-consuming. It eliminates the possibility of future bleeding and secondary operations either as a result of the primary operative procedure or of the late sequelae. Nephrectomy should never be done unless one has demonstrated a good contralateral kidney. It is indicated in the following situations:

1. Extensive destruction of renal tissue
2. Multiple deep lacerations
3. Grossly torn or injured pedicle
4. Irreparable damage of the pelvis, ureter, or both
5. Persistent or marked secondary bleeding
6. Tear into a short pedicle preventing delivery of the kidney for a conservative procedure
7. Hydronephrosis or other serious disease of the kidney
8. Persistent urinary sinus
9. Cortical abscesses of the kidney

Nephrectomy however, is rarely indicated immediately after the injury. It is extremely hazardous and carries with it a high mortality because of the facts that the patient has just come out of shock, the tissues are extremely friable, and profuse and fatal hemorrhage may arise on freeing of the fresh blood clots. Increased experience has shown that better results are obtained by waiting 3 or 4 days after the injury if possible, and if at that time nephrectomy cannot be safely performed, it is much wiser to drain and pack, and leave the nephrectomy till a later date. If it becomes urgent to remove the kidney and the pedicle is friable or extremely indurated, it is much safer to leave the pedicle clamps in place following nephrectomy rather than to attempt tying the pedicle with the risk of the suture's slipping off or cutting through. The clamps may then safely be removed in 7 days in the operating room under gas anesthesia. In any operation on the kidney for trauma, it should be remembered that the field is infected and it is good judgment to close only about half of the wound. This will prevent deep infections of the kidney and wound.

The care of the late sequelae, such as kidney abscess, perirenal suppuration, subphrenic abscess, hydronephrosis, pyonephrosis, and of other complications is based on the principles of treatment of these conditions, whatever their etiology may be.

Throughout the management of renal trauma, be it conservative or surgical, one should make use of blood and the appropriate chemotherapeutic agents as the case requires. Both conservatively and surgically treated patients should be checked with excretory urography and retrograde studies. These should be repeated at regular intervals for at least 10 years in order to determine and treat any secondary complications that may arise. It is only by following all cases of renal trauma over a long period of time that adequate statistics can be set up to determine whether the principles which have been outlined in this article are correct.

Summary and Conclusions

1. An evaluation of the principles concerned in the management of renal trauma has been undertaken in order to answer several important problems relative to this subject.

2. A review of this and other series of renal injuries reveals that since there is no relation between the intensity of the traumatism, the clinical signs, the symptomatology, and the gravity of the renal lesion, the patient should be examined urologically as quickly and completely as possible. While a simple film and excretory pyelography should be done in every case immediately after the injury, even at the bedside if necessary, retrograde study is indicated as a routine procedure whenever feasible. It produces a better pyelogram and demonstrates extravasation, when present, much more assuredly than excretory urography. It is the only reliable and scientific basis for an anatomicopathologic diagnosis which is so necessary in the evaluation of conservative versus operative intervention.

3. Since 1937 there has been a decided decrease in the death rate due to renal trauma. The reported mortality is upward to 27 per cent, but if one eliminates the patients in a moribund condition or with severe associated injuries on admission, the mortality drops to about 4 per cent.

4. Despite the decrease in mortality, there has been an astoundingly large group of complications and a reduction in kidney function as an aftermath of renal injury. Experimentally and clinically, these complications occur in the cases of ruptured kidney treated expectantly.

5. In the patients who do not die soon after their injury, the indications for immediate or emergency operation are determined by the clinical picture of grave hemorrhage, a severe associated intraperitoneal lesion, or of both.

6. The indications for delayed surgery have never been agreed upon. I believe that the pyelographic evidence of extravasation should determine the need and be the basis for delayed surgery before deterioration in the clinical picture makes such interference necessary.

7. If the case is proved to be one of contusion (Type 1 or 2), conservative treatment with rest in bed for at least 2 weeks is advised. If the case is one of true rupture (Type 3 or 4), early surgical interference is advised. This may best be done 3 or 4 days after the injury. Although the indications for nephrectomy have been enumerated, one should never nephrectomize a patient without having demonstrated another good kidney.

8. A careful follow-up of my series and that of others impresses me with the excellent end results of ruptured kidneys treated by conservative operative intervention. This clinical experience fortified by experimental evidence has justified a continuation of this practice.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Complications and Sequelae of Untreated Fractures of the Facial Bones and Their Treatment. F. T. MOORE and T. G. WARD. *Brit. J. Plast. Surg.*, 1949., 1: 257.

Because facial fractures may not seriously affect the patient's general condition and because the general surgeon often does not have the training and equipment to treat them properly, these deforming injuries are often given little or no treatment, with the rationalization that the plastic surgeon may correct the deformities later if the patient so desires. It must be stressed that early treatment of such injuries is more convenient and effective for both patient and doctor than the treatment of a malunion with refracture, reduction, bone grafts, and other procedures which may be necessary at a later date.

Co-operative effort of the plastic, orthopedic, neurological, and ophthalmic surgeons must be effective from the beginning to avoid extensive, multiple-stage plastic procedures to correct facial deformities later.

Fractures of the middle third of the face may result in multiple complications. Aside from the obvious deformity, they include nasal obstruction, anosmia, diplopia, lacrimal apparatus involvement, enophthalmos, injuries to the eye or optic nerve, malocclusion, and injuries to the maxillary division of the fifth cranial nerve.

If malunion of facial fractures has occurred, with any of these complications, the method of choice is refracture and realignment of the fragments. Immobilization is essential and is accomplished by the authors by means of a vertical rod in front of the face, fixed at its upper end to a plaster headcap and at its lower end to a bar attached to full cap splints on the upper and lower teeth. The movable fragment may then be pinned with a wire bowstring which is fixed to the vertical rod. Such an apparatus is illustrated in the original article. The orbital floors and other antral walls may be immobilized by packing the antra with ribbon gauze, which was left in place 37 days in 1 case. The antra are reached through incisions in the buccal sulcus.

A classification of maxillary fractures is presented, according to the location and direction of the fracture. STANLEY W. TUELL, M.D.

EYE

Ocular Cysticercosis. LECH JUNIOR. *Am. J. Ophth.*, 1949, 32: 523.

The author discusses ocular cysticercosis from the following points of view: history, pathogenesis, casuistics, diagnosis, treatment, prognosis, pathology, prophylaxis, and iconography. He points out that cysticercosis of the eye is a rare disease which may be overlooked by an inexperienced observer. The diagnosis is especially difficult when only a single part of the parasite is found such as its hooks.

Schott and Sommering in 1829 independently observed the same cysticercus in the anterior chamber. Schott extracted the parasite. Siebold, in 1838, reported a subconjunctival cysticercus observed by Baum. Coccius reported a cyst in the vitreous resembling a cysticercus. In 1854 cysticercus in the vitreous and under the retina was reported by von Graefe who by 1866 had seen more than 80 cases among 80,000 patients.

Ocular cysticercosis follows the same laws of general infestation as cysticercus cellulosae, the larva of tenia solium. Heteroinfection is more common than autoinfestation. The parasite may be found in all the tissues of the eye except the lens. If an exudative inflammatory reaction occurs the following may develop: exudate, iritis, uveitis, purulent iridocyclitis, panophthalmitis, detachment of the retina, synechia of the iris, complicated cataract, and atrophy of the eyeball.

Ocular cysticercosis is a rare occurrence. There were 116 cases in a series of 54,000 patients, a ratio of 1 to 1,383. The first symptom is reduction in vision. If the media are clear, the cysticercus can be identified by its bluish white spherical vesicle with peripheral iridescent reflexes and slight undulatory movements and by its scolex which, when evaginated, reveals the sucking cups and when invaginated appears as a denser white spot in the center of the vesicle; if the media are turbid diagnosis is more difficult. The subconjunctival cysticercus resembles a lymphatic cyst from which it can be distinguished by a denser white spot in the center.

The complement fixation reaction in the blood is positive in 73.2 per cent of cases.

Although extraocular cysticercus is benign, intraocular complications usually result in blindness. The parasite, alive or dead, is destructive to the eye. Medical therapy and destruction of the parasite by caustics, diathermy, or electrolysis is ineffective. When it is situated behind the lens, extraction by the transcleral route is necessary. In 40 attempts, 34 extractions from the vitreous or from the subhyaloid area were successful. In 21 trials, 15 parasites were removed from beneath the retina, 7 of these being spontaneous extrusions after incision of the sclera and choroid. In early cases of subretinal cysticercus, extraction by means of diathermic localization under ophthalmoscopic control is recommended.

Control and inspection of meat, and personal and dietary hygiene, especially in rural areas, are necessary prophylactic measures.

JOSHUA ZUCKERMAN, M.D.

Tumors of the Optic Nerve: Long Survival in 3 Cases of Intracranial Tumor. MARVIN POSNER and GILBERT HORRAX. *Arch. Ophth.*, Chic., 1948, 40: 56.

Tumors of the optic nerve may be classified into two general groups: (1) intraneural tumors (the gliomas) arising within the nerve stem; and (2) extraneural tumors arising in the nerve sheath and comparable to the meningiomas of the brain. Additionally, a fibromatosis of the sheath is rarely observed. Any type of optic nerve tumor may spread intracranially or intraorbitally (or both).

Tumors confined to the orbit cause a painless unilateral exophthalmos followed by progressive amaurosis. Intracranial spread or origin may cause symptoms simulating those caused by other tumors of the chiasmal or suprasellar region. The diagnosis of intracranial tumor of the optic nerve is suggested by unilateral exophthalmos and failure of vision, together with a normal visual field and central visual acuity in the other eye in a patient showing no other evidence of intracranial disease. Roentgenographic evidence of an enlarged optic foramen or erosion under the anterior clinoid process is significant.

Three patients, aged 8, 52, and 18, respectively, have been followed for periods of 12, 10, and 4 years after craniotomy and removal of optic nerve tumors. The chief complaint of all was a progressive reduction in vision of one eye ending in blindness. Two of the patients had a unilateral optic atrophy, while the third had a protrusion of the tumor into the eye at the disc, giving the appearance of papilledema which subsided after removal of the main growth. The long survival of these patients following surgery suggests that these tumors have not a uniformly hopeless prognosis, as was previously believed, and that patients are benefited even if the tumor is incompletely removed. FRANK W. NEWELL, M.D.

EAR

Ménière's Syndrome: Its Relation to Chemistry; an Etiologic Study. GRANT SELFRIDGE. *Arch. Otolar.*, Chic., 1949, 49: 1.

The cause of Ménière's disease is unknown and has been ascribed variously to many things, such as high or low blood pressure, syphilis, infection, various metabolic disturbances such as those due to salt, potassium, magnesium, iodine, and calcium. No one has noted the relationship between nutritional disturbances and vertigo, which is the purpose of the present article.

Because the lack of sufficient amounts of vitamin, particularly thiamine, nicotinic acid, riboflavin, pantothenic acid, and pyridoxine, plays a part in the aging process one is justified in saying Ménière's disease is a function of the aging process. In one report of 33 cases all of the patients were over 50 years of age. In the other cases all of the patients of 40 years or older showed thiamine and nicotinic acid deficiency in the urine.

Allergy has been mentioned as a cause of vertigo. Grove stated that many patients presented extra-aural symptoms—headaches, vasomotor rhinitis, gastrointestinal symptoms, insomnia, and urticarias.

The value of histamine in the treatment of Ménière's disease varies according to the authors, but the majority of the authors do not consider that it tells the whole story.

Many authors consider Ménière's disease to be due to disturbance of the water metabolism. In treatment the tinnitus was not much affected.

In summary and conclusion, the author states that deafness (and this includes Ménière's disease) is not related to one thing, but is related to all factors involved in growth, i.e., endocrine products, electrolytes, amino acids, and vitamins, including vitamin A. In the author's experience, patients with eighth nerve deafness with only slight upper tone loss recovered in a few weeks with thiamine chloride and nicotinic acid, while patients who had an abrupt loss did not show any recovery.

A review of the literature gives the impression that the most favorable results have been obtained from the use of several vitamins, and severance of the eighth nerve is not as popular as formerly. It hardly seems preposterous to make the claim that Ménière's disease is a chemical problem still requiring further study, and that it is related to nutritional and environmental factors. JOHN F. DELPH, M.D.

Ménière's Syndrome: Observations on Vitamin Deficiency as the Causative Factor; The Vestibular Disturbance. MILES ATKINSON. *Arch. Otolar.*, Chic., 1949, 49: 151.

In earlier articles the author described two groups of cases of Ménière's disease on the basis of the degree of reaction to histamine administered intradermally. In the group with a small response the condition was interpreted as being due to vasospasm and that with a strong response as due to a primary vasodilatation.

Eighty-seven cases of Ménière's disease were examined for clinical evidence of deficiencies of the vitamin B group. These deficiencies were correlated with the type of vertigo and the character of the response to histamine given intradermally.

The following conclusions were drawn:

1. The patients who experience rotational vertigo alone show signs of nicotinic acid deficiency; they give a small response to histamine, and can be relieved of their attack with nicotinic acid.

2. The patients with positional vertigo alone, described as momentary dizziness on sudden movements of the head, or as longer periods of general unsteadiness, have riboflavin deficiency symptoms; they give a strong response to histamine, and are relieved by the administration of riboflavin.

3. The patients who have both types of vertigo show signs of deficiency of both vitamins, give an

intermediate response to histamine, and respond only when both nicotinic acid and riboflavin are given. JOHN R. LINDSAY, M.D.

Surgery of Chronically Discharging Ear. HOWARD P. HOUSE. *Arch. Otolar.*, Chic., 1949, 49: 135.

The author describes several important anatomic landmarks and surgical maneuvers in endaural temporal bone surgery for chronically discharging ear.

A perforating burr is used to enter the antrum. The point of entrance is such that an imaginary line drawn directly posterior from the superior margin of the external bony ear canal will cross the upper margin of the completed perforating burr hole. A line drawn directly superior from the posterior margin of the bony external ear canal will cross the anterior margin of the completed perforating burr hole. This burr hole should never be deeper than the cutting portion of the burr.

In the simple mastoidectomy, after the posterior bony ear canal wall has been thinned, the dural plate exposed, and the horizontal canal identified, a small burr is used to remove the zygomatic cells. The removal of these cells exposes a thin shelf of bone which forms the external wall of the epitympanum.

The modified radical mastoidectomy is a continuation of this procedure. The thin bone shelf overlying the epitympanum is removed and the short crus of the incus and the neck and head of the malleus are exposed. The posterosuperior bony ear canal wall is then taken down. The narrow Lempert elevator is used to separate the membranous canal wall from the bony bridge which is then removed with the rongeur. Pathologic tissue is removed from the epitympanic area. If there has been necrosis in the ossicular chain, the incus and the head and neck of the malleus are removed. A flap may be created as in the fenestration operation. If the epitympanic pathologic tissue has been satisfactorily removed the skin flap is not created and the cavity is allowed to heal as in a simple mastoidectomy. The attic perforation usually closes spontaneously.

In the radical mastoidectomy all remnants of the incus and malleus are removed. A skin flap may be created or completely removed. When the skin flap is preserved, an additional graft may be acquired from the postauricular area and when used seems to expedite healing of the cavity. Before granulations are removed from the middle ear the fallopian canal must be brought into view to avoid injury to the facial nerve. This is accomplished by carefully elevating the periosteum over the horizontal canal until its anterior extremity is reached. The dull ring curette is then directed over the processus cochleariformis into the middle ear. The processus cochleariformis is fractured externally and the tensor tympani muscle and all accessible pathologic tissue in the middle ear are removed.

Granulations over the stapes area can be more safely removed if one uses a posterior to anterior maneuver, which takes advantage of the counterpull of the stapedius tendon. JOHN R. LINDSAY, M.D.

Lempert Endaural Subcortical Mastoidotympanectomy for the Cure of Chronic Persistent Suppurative Otitis Media. JULIUS LEMPERT. *Arch. Otolar.*, Chic., 1949, 49: 20.

The chief complaint of almost every patient suffering from chronic otitis media without intracranial complications, for whom mastoidotympanectomy is indicated and advocated by his otologist, is, as a rule, the annoying discomfort of the persistence of his long-standing middle ear discharge, the arrest of which has resisted all available medicinal therapy.

Both the unwillingness of the otologist to assure the patient reasonably of a permanently dry middle ear and his volunteering the information that intracranial extension of the infection will thus be prevented are, as a rule, based on his own experience with mastoidotympanectomy without any attempt on his part to analyze and determine the causes which make such inconsistent facts possible.

The prevention of intracranial extension of the infection is naturally governed by the same surgical factors in the performance of mastoidotympanectomy which govern the arrest of the suppurative discharge, namely, the complete exenteration of the foci of infection. Therefore, it is inconsistent for an otologist to give hope for the prevention of extension of the infection in the face of his lack of confidence regarding his ability to arrest the discharge.

The traditionally accepted and most commonly employed technique of mastoidotympanectomy, known as the Schwartze postauricular radical mastoidectomy, is not conducive to, and does not encourage, the average otologist either to explore successfully, or to eradicate completely by surgery when explored, the varied and multiple pathologic processes which may be encountered. Only after a large experience with this technique can the especially skilled otologist cope successfully with the commonly encountered small sclerotic mastoid process and perform a complete mastoidotympanectomy, and then not always without accident.

The average otologist, when performing the Schwartze radical mastoidectomy, does not in the majority of instances remove completely the pathologic process responsible for the middle ear discharge. The inadequate performance of the Schwartze postauricular radical mastoidectomy is usually prompted by the surgeon's fear of injuring instrumentally one or more of the many vital anatomic structures which may be encountered blindly.

The adjective "radical" when applied to the Schwartze technique is therefore an exaggeration, for the way it is practiced by the average otologist makes the adjective "incomplete" more appropriate and more explanatory.

It is a well established fact today that mastoidotympanectomy can be performed through endaural incisions alone without a supplementary postauricular incision. The postauricular incision is therefore not only unnecessary but also nonsurgical in principle since it involves a sacrifice of soft tissue greater than necessary for accomplishing the desired result.

The technique is fully described and illustrated with 13 drawings.

Certain advantages are claimed for the endaural method, such as eliminating the blind search for the antrum by directing all the instrumentation away from the vital structures toward the operation with no danger of a postauricular fistula.

Any well trained otologist of average skill, though young in experience, can successfully perform the endaural subcortical mastoidotympanectomy without being handicapped by the mental hazards which prevent him from performing the Schwartze radical mastoidectomy successfully.

JOHN F. DELPH, M.D.

Reconstruction of the Auricle with Diced Cartilage Grafts in a Vitallium Ear Mold. LYNDON A. PEER. *Plast. Reconstr. Surg.*, 1948, 3: 653.

This article is profusely illustrated with 24 photographs and drawings, all with descriptive texts. Essentially, the technique of reconstructing the auricle consists of exposing the ear cartilage and burying it beneath the skin and during the same operation an ear mold filled with diced cartilage is inserted in an abdominal pocket. Five months later the cartilaginous framework is removed from the mold, and the upper part of the framework, which corresponds to the ear defect, is buried in the skin in the exact location of the defect. An Esser inlay is used to cover the back of the framework and raw scalp surface.

Whenever possible the first operative step to reconstruct an auricle should begin when the child is about 4 years old. This allows the surgeon a sufficient time interval in which to complete the ear before the child enters school, which lessens his handicap and facilitates adjustment with his schoolmates.

Autogenous cartilage is always the material of choice for transplantation. It survives as living tissue, is not subject to invasion or absorption, and, like an autogenous skin graft, it remains until the individual in whom it is transplanted dies. This is true whether the cartilage is transplanted with or without its perichondrium.

Preserved cadaver grafts are invaded by fibrous tissue usually over long periods of time, but occasionally they are absorbed rather suddenly. Therefore, preserved cadaver cartilage is not good grafting material to support an ear in a young child with a possible 60 year life expectancy.

Dupertuis demonstrated the growth of costal cartilage grafts in rabbits, and the author's own experimental studies with young human costal cartilage grafts indicated that there was a small increase in the size of the graft in most cases. It should be emphasized, however, that the growth possibilities in an ear framework constructed of multiple segments of young costal cartilage grafts are not known.

From a clinical standpoint, at this time, the author forms the reconstructed ear slightly larger than the normal ear and plans to make any necessary adjustments when and if they are necessary.

JOHN F. DELPH, M.D.

Modified Radical Mastoidectomy: Preservation of the Cholesteatoma Matrix; a Method of Making a Flap in the Endaural Technique. SHIRLEY HAROLD BARON. *Arch. Otolar.*, Chic., 1949, 49: 280.

The somewhat confused literature on chronic otorrhea and its therapy is reviewed. The pathology and pathogenesis divide chronic otorrhea into a benign type with central perforation and mucoid discharge, and a dangerous type in which cholesteatoma is present. Cholesteatomas are squamous epithelial-lined cysts filled with epidermoid debris and its decompensation products. They are subdivided into true cholesteatomas and pseudocholesteatomas, which are pathologically identical. True cholesteatomas (better called *congenital cholesteatomas*) are not associated with the ear. They are due to the rather rare congenital epithelial rests occurring anywhere in the skull. Pseudocholesteatomas (better called *acquired cholesteatomas*) are due to a process which takes place after birth. They are differentiated into primary acquired cholesteatomas, in which there is no previous acute suppurative process, and secondarily acquired cholesteatomas, which are secondary to an acute necrotic middle ear infection. This infection destroys not only all of the mucous membrane of the middle ear but all or at least a marginal portion of the drum and allows healing to take place by an ingrowth of squamous epithelium into the middle ear. This results in a cholesteatomatous cyst or sac of which the neck is connected to a marginal perforation in the tympanic membrane. The primarily acquired cholesteatoma is an epithelium-lined cholesteatomatous sac of which the neck is connected to a perforation in the Shrapnell membrane. This type is secondary to a chronically obstructed eustachian tube with retraction of Shrapnell's membrane or to infantile otitis.

The author believes that cholesteatomas cannot be cared for safely by conservative therapy such as attic irrigations, at least not in most cases. She also believes that in almost all cases cholesteatomas can be cared for by the modified radical operation which has the great advantage that no further damage is done to the conductive mechanism of the middle ear, so that hearing is preserved and sometimes actually increased as the ear becomes dry. The modified radical operation should be done in all cases in which the lateral half of the cholesteatomatous sac can be exposed without injury or destruction of any vital portion of the middle ear conduction mechanism. In most cases this means attic cholesteatomas in which the outer attic wall can be taken down to expose the cholesteatomatous sac. The outer half of this sac and the outer half of the neck of the sac are removed. The previously elevated skin of the superior canal wall is slit longitudinally to communicate with the neck of the sac and then is laid backward to provide a plastic skin graft to help line the new addition to the canal wall. This procedure incorporates the attic portion of the tympanic cavity and the excavated outer attic wall into the bony canal wall. The inner portion of the cholesteatomatous sac is left as it helps to

epithelize the cavity. The outer portion of the meatal skin flap is then laid anteriorly to help epithelize the anterior canal wall.

In cases in which complete exposure of the cholesteatoma requires removal of the ear drum and other hearing structures, a radical mastoidectomy must be done. Postauricular incision may be used but the endaural approach is much more satisfactory. WILLIAM K. WRIGHT, M.D.

NOSE AND SINUSES

The Role of the Septum in Rhinoplasty. JACQUES W. MALINIAC. *Arch. Otolar.*, Chic., 1948, 48:189.

The author attempts to elucidate the supporting function of the septal, triangular (upper lateral), and quadrangular (alar or lower lateral) cartilages of the nose. He believes a rhomboid "weak spot" in the cartilaginous framework is present at the junction of the upper and lower lateral cartilages anteriorly and is a likely spot for a depression deformity of the nasal profile in the event of an excessive removal of the nasal septum. The alar dome, he alleges, "is suspended by the upper lateral cartilages from above and supported by the lower lateral cartilages from below."

Suggestions as to technique are made for three types of septal deformities: (1) septal deflection with oversized hump deformity, (2) crushed septal fracture with depressed external deformity, and (3) septal deflection with external lateral deflection. "As a general rule, if the deflection is such as to interfere with the successful performance of corrective rhinoplasty, it should be repaired simultaneously with, or prior to, the latter."

JOHN J. BALLENGER, M.D.

Potential Hazards from Radiation Treatment of Hypertrophied Lymphoid Tissue in the Nasopharynx. LAURENCE L. ROBBINS and MILFORD D. SCHULZ. *Laryngoscope*, 1949, 59: 147

A warning is issued of the possible dangers in the use of the radium applicator in treating hypertrophied lymphoid tissue of the nasopharynx.

Latent radiation necrosis has been seen from 10 to 20 years after treatment of benign lesions of the skin. The radiation dosage in some of these cases was approximately the same as that now recommended for use in the nasopharynx for the reduction of hypertrophied lymphoid tissue.

The following suggestions are made:

1. The use of radium treatment with the monel metal applicator should not be routine.

2. Except in selected cases the treatment, when given, should consist of no more than an erythema dose.

3. The erythema dose should be determined individually for each applicator and, if any other means of determining the proper dose for a particular applicator fails, the dose may be estimated by trial on the operator's skin.

JOHN R. LINDSAY, M.D.

MOUTH

Chemosurgical Treatment of Tumors of the Parotid Gland. FREDERIC E. MOHS. *Ann. Surg.*, 1949, 129: 381.

The main object of parotid tumor surgery is: (1) the complete removal of the neoplasm, and (2) the preservation of as much of the facial nerve as possible.

After premedication with morphine sulfate (0.015 gm.) a keratolytic, dichloracetic acid is applied to the portion of tumor covered by skin. Whitening of the skin indicates that the keratin layer has been rendered permeable to the zinc chloride. The latter is applied as a paste about 3 mm. thick; it contains 40 gm. of stibnite (80 mesh sieve), 10 gm. of powdered sanguinaria, and 34.5 c.c. of a saturated solution of zinc chloride. The treated area is covered with a thin layer of cotton and then a second layer of cotton with petrolatum to get a moisture tight closure.

After 24 hours a layer of tissue about 1 cm. thick is excised; if there is doubt about the extent of neoplastic involvement frozen sections are made. As a rule, there is no pain and no bleeding because the incision is made through killed and fixed tissue. Following the excision the fixative is reapplied, and the procedure is repeated after 24 hours. After several days it is usually impossible to differentiate grossly normal from cancerous tissue. Therefore frozen sections are made and the areas of cancer are marked with red pencil on a corresponding map, the latter corresponding to an area marked on the lesion with merbromin. The fixative is then reapplied to the involved area. This process is repeated for several days until all involved areas are gradually excised.

In some areas the neoplasm extends more than 2 cm. beyond the grossly visible tumor; it may follow the perineural lymphatics of the facial nerve or the perimysium of the stylohyoid muscle. Without systematic microscopic control these extensions would have been missed.

The treatment of 17 patients is reported. A case of an 80 year old patient is described; he was treated for a parotid squamous cell carcinoma, grade 3, measuring 6.5 by 8 cm. and with a central ulceration. The procedure lasted for 20 days, and the defect was healed 2 months later with paralysis of only the mandibular branch of the facial nerve.

In younger patients a prophylactic or therapeutic neck dissection is recommended; also a carotid ligation before treatment is at times advisable in order to avoid hemorrhage, which occurred in 4 of 17 cases and required a suture-ligature or pressure dressing. Ligation of the external carotid artery was performed, once prior to therapy because of obvious deep extension, and a second time because extension around the external carotid was found. Salivary fistulas lasting from 1 week to 21 months were encountered in 15 of the 17 cases reported. Only 4 fistulas persisted over 4 months. Fistulas may be

eradicated by the application of the zinc chloride fixative to the exposed epithelium.

Nearly two-thirds of the patients had previous unsuccessful surgical excision or radiation treatment. Previous treatment did not reduce the cure rate (71.4%) as compared with 50 per cent in 4 cases not previously treated. Most of the lesions were large and deep seated. Thirteen cases were observed for 3 years with 63.6 per cent cure rate, and 12 cases for over 5 years. Of these, 2 were in the indeterminate group and 10 in the determinate group. In 6 of the latter (60%), successful results were obtained. In 1 case the patient was free of cancer for 11 years. The cure rate was greater for smaller lesions, i.e., 100 per cent for those under 4 cm. in diameter, and 50 per cent for those over 4 cm.; the latter showed an increased tendency to metastases and involvement of the vital structure.

Of the 4 cases giving unsuccessful results, 2 showed metastases, 1 revealed extensive permeation of the perineural lymphatics, and 1 ended in operative death from pulmonary edema and pneumonia in a very poor risk patient with extremely advanced disease.

The degree of malignancy had influence on the rate of curability, e.g., 4 patients with moderately invasive carcinoma were all cured while only 50 per cent of patients with highly invasive carcinoma were cured. Three cases classified as moderately invasive carcinoma arising from a mixed tumor gave a 33 per cent cure at 3 years.

The site of origin, whether retromandibular or preauricular, had no influence on the prognosis. Metastases were not noticed on the first visit of any of the patients in the series. Three patients with metastases noted later were treated by palliative roentgen radiation, and 1 by radical neck dissection. The latter patient showed no evidence of recurrence after 5 years.

Only 4 patients with benign mixed tumors were treated chemosurgically since surgical excision is fairly reliable. All 4 had a 3 year cure, and 2 of them in the 5 year group were also free of recurrence. Paralysis involving only the mandibular branch of the facial nerve occurred in 1 case.

The chief advantage of the chemosurgical treatment of carcinoma of the parotid gland is obtained by systematic microscopic control of the excision. Results compare very favorably with those obtained with surgery, electrosurgery, or radiation. The author compares his 3 year cure rate of 63.6 per cent with other reported cure rates of 33.3 per cent or less.

A second advantage is conservatism resulting in the preservation of normal tissue, particularly of the facial nerve which was partially or totally preserved even in the presence of extensive carcinoma. This is impossible with radical surgical excision of advanced carcinoma.

Low operative mortality is a further advantage (only 1 death in 17 cases).

Disadvantages of the procedure are: (1) it is time-consuming for the operator, and painful for the patient, (2) special training and practice are essential for best results in following an unpredictable "silent" outgrowth of the tumor beyond the limits of the parotid gland, and (3) a clinic with provision for the special frozen section technique is required.

ARTHUR J. LESSER, M.D.

NECK

A Contribution on 564 Goiters and 543 Goiter Operations Performed in 1946 (Ueber 564 Strumen und 543 Strumaoperationen des Jahres 1946). ROMAN FISCHER. *Helvet. chir. acta*, 1949, 16: 36.

Of 543 goiters observed during the year 1946, 449 were either diffuse or adenomatous and nontoxic, 36 were recurrent and nontoxic, 40 were diffuse or adenomatous and toxic, 1 goiter was recurrent, 4 were malignant, 5 were inflammatory, and 8 were instances of Basedow's or Graves' disease.

According to the histologic examination, there were 301 parenchymatous nodular goiters, 58 colloid nodular goiters, 29 mixed adenomas, 60 hyperplastic nodular goiters, 52 diffuse colloid goiters, and 14 diffuse parenchymatous goiters; less frequent types of thyroid conditions made up the rest of the material.

One hundred and eight patients, or 20 per cent of the entire group, were men and 456 patients, or 80 per cent, were women.

The great majority of patients were between 34 and 54 years of age. The youngest one operated on was 1¾ years, and the oldest was 78 years. In both cases the operation was indicated because of acute dyspnea.

The sedimentation rate of the blood is determined before the operation in each case. If the rate is abnormal, a fluoroscopic examination of the chest is done. If hyperthyroidism is suspected, the determination of the basal metabolic rate is supplemented by the determination of cholesterol in the blood.

In 3 instances a thyroidectomy was performed during the first half of gestation, without interruption of the pregnancy. In such cases the postoperative prophylactic iodine dose is tripled for the remainder of the pregnancy.

The patient is given 0.01 gm. of morphine with atropine an hour before operation, and the operation is performed under local anesthesia, produced with a 1 per cent novocaine solution, with or without adrenalin. Recently the author has been giving a 2.5 per cent solution of avertin per rectum for the induction of anesthesia.

As to the technique of the operation, the ribbon muscles are severed in nearly every case. The inferior artery is ligated within the fascia, close to the carotid artery. The isthmus is always severed and resected. A drain is placed in the wound for 24 hours. A preliminary extrafascial ligation of the inferior thyroid artery is of no decisive value for the prevention of injury to the recurrent nerve. The presence of even a very large intrathoracic and retromediastinal goiter never necessitated splitting of the sternum.

The operative mortality was 0.18 per cent.

Forty-one patients, or 7 per cent of the entire material, had clinical symptoms of hyperthyroidism. In such cases the cholesterol content of the blood was usually abnormally low with lymphocytosis.

Leucopenia, swelling of the lymph glands, arthritic changes, or exanthemas after the administration of thiouracil were never observed, and the circumference of the neck did not increase. For a few days before the operation thiouracil is given concurrently with Lugol's solution. The medication does not replace the operation but puts the patient in a better condition for the surgical procedure.

In 28 of 543 thyroidectomies, or 5 per cent of the entire material, a paralysis of the recurrent nerve was observed. This condition was also noticed in 1 per cent of the patients with recurrent goiters. Occasionally a postoperative hematoma may cause paralysis of the recurrent nerve.

Tracheotomy during or after thyroidectomy was required in 6 cases because of injury to the recurrent nerve, edema of the larynx, tracheitis, or tracheomalacia.

The surgeon should not hesitate too long to perform a tracheotomy or to remove a hematoma.

If a considerable loss of blood occurs at the operation, 20 c.c. of a 3 per cent coagulen solution are placed into the wound.

Symptoms of tetany were noticed in 11 cases, or 2 per cent of the entire material. In the majority of the patients there were only transient paresthesias, while classical tetany was noticed in only 2.

A postoperative crisis was recorded in 25 patients, or 5 per cent of the total number operated upon. These were treated with 0.2 gm. of quinidine per os every 3 to 4 hours, and calcium was given intravenously to combat the frequently occurring edema of the larynx. The favorable effect of antihistaminic drugs supports the theory that postoperative hematoma releases histamine and contributes to the crisis.

A wound infection was noticed in 5 cases, or less than 1 per cent of the entire operative material. Early aspiration has considerable prophylactic value in this condition.

To prevent recurrences, patients with a nontoxic goiter are given 3 drops of Lugol's solution daily after the operation. JOSEPH K. NARAT, M.D.

The "Reverse King Operation." A Surgical Procedure for Restoration of Phonation in Cases of Aphonia Due to Unilateral Vocal Cord Paralysis. LEWIS F. MORRISON. *Ann. Otol. Rhinol.*, 1948, 57: 945.

This operation is devised for patients with unilateral vocal cord paralysis, in whom the paralyzed vocal cord is in extreme abduction so that the mobile vocal cord cannot compensate by approximation.

The author used the principle of freeing the immobilized vocal cord and fixing it in the midline following a preliminary tracheotomy 8 days before the operation.

At operation, the left arytenoid muscle was bound by small fibrous bands to the cricoid. The entire posterior cricoarytenoid, and the major fibers of the lateral cricoarytenoid muscles were cut for the upper posterior rim of the cricoid is higher than the articular region. In order to secure good approximation of the vocal cords, the author removed a thin 1.5 mm. segment, to permit approximation of the vocal cords and secure better fixation. The arytenoid muscle was completely freed. The fixation was done with black cotton, although the author believes that atraumatic P271 No. 1 chromic catgut should be used. The suture was passed through the soft tissues of the perichondrium and the upper portions of the posterior surface of the cricoid cartilage, and emerged at the articular surface edge. The needle point next entered the cut surface of the cricoid cartilage and emerged on the posterior surface about 2.5 mm. below the point of entry. The tie knot presented posteriorly.

Two months later the patient was able to talk without fatigue. The left vocal cord was taut and in phonation at the same level with the active vocal cord. The mortality of this procedure should be that of the general mortality involving these tissues.

FRED W. S. MODERN, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Thorotrast Pyograms in Cerebral Abscess. G. K. Tutton and W. H. T. Shepherd. *Brit. J. Surg.*, 1949, 36: 240.

Although the value of thorotrast visualization of intracranial abscesses has been well recognized, there has been comparatively little written about their detailed appearance and its implications. The authors report their study of 56 cases of intracranial abscesses in which thorotrast visualization (pyograms) had been carried out. Thirty-eight of the abscesses were due to a direct spread of otogenous origin, paranasal sinusitis, or osteomyelitis of the vault; there were 6 deaths in this group. Seven cases were post-traumatic with 2 deaths. Nine cases were metastatic with 7 deaths, and 2 were of postoperative infection with 1 death. Hence, among the 56 cases there were 16 deaths.

The usual routine in the treatment of a brain abscess is a needle exploration for the abscess through a burr hole. When the cannula is within the abscess cavity its position is maintained and pus is permitted to escape spontaneously. Gentle aspiration is then performed, after which "a mixture of the appropriate antibiotic and 2 c.c. of thorotrast are injected through the cannula." If air is not spontaneously sucked into the cavity, about 2 c.c. are injected, after which the needle is withdrawn and the incision is closed.

A standard roentgenologic technique is advocated in order to permit accurate comparisons with future films. Besides the more routine positions of skull studies, a lateral film in the brow up and brow down position is particularly important. Usually repeat studies are made 4 days after the initial injection, or earlier if necessary, and thereafter at weekly intervals. If the pyograms reveal an insufficient amount of thorotrast, a second injection is made. The initial roentgenograms reveal the thorotrast as an ill-defined shadow, irregular in outline and density. The abscess capsule is usually not visualized until between the sixth and thirty-fifth days after injection in the more acute abscesses which have been present less than 28 days. In abscesses of 30 days or older, the capsule is usually seen within 4 days.

The course of the abscess can be followed in the late stages by the roentgenologic changes of the capsular shadow. Cases in which the head has not been moved about freely or in which a small amount of thorotrast has been injected reveal only a part of the capsule to be well visualized. This would be the most dependent portion. Initially the shadow is spherical, ovoid, or loculated. After resolution of the abscess either by repeated aspirations or a natural process, the capsule becomes thickened and crinkled. If the outline becomes smoother and more spherical, it indicates that the abscess is enlarging. This is a most important point, since the clinical signs may be very late in appearing.

An important finding by the authors is that the presence of tracts, communications, or pointing of the capsule may suggest the origin of the infection. With shrinkage or contraction there is usually a migration toward the sight of origin or attachment which may not have been obvious in the initial pyogram.

Loculation was present in almost half of the cases. Twelve were recognized in the first pyogram and 9 were recognized either at later studies or in retrospect. In 2 cases of verified loculation, the pyograms were negative. Loculation was most easily demonstrated in temporal and cerebellar abscesses.

Four cases of associated intracerebral and subdural abscess were observed in this series. Subdural abscesses on the medial or inferior surfaces of the hemisphere can be definitely recognized only by pyography since it can be tapped only by passing through the cerebral substance.

The progress of the capsule formation is the most definitive indication for surgical excision since both the age of the abscess and the thickness of the capsule can be formulated. In the present series the average thickness of the capsule at time of surgical removal was 2.7 mm. and the average age was 76 days. The abscess was usually extirpated through an osteoplastic flap unless it was felt that to do so would cause irreparable functional damage.

Jack I. Woolf, M.D.

Abscess of the Frontal Lobe Secondary to Ethmoiditis. Joseph H. Kler. *Arch. Otolar.*, Chic., 1949, 49: 125.

The author discusses 3 cases of ethmoiditis which were complicated by single encapsulated frontal lobe abscesses. They presented signs of increased intracranial pressure, meningeal irritation, and periorbital swelling.

Chronic infection of the ethmoid cells is more likely to develop into cerebral abscess than acute infection. The infection passes by continuity through the bone and the meninges, or extends by way of thrombophlebitis of the veins communicating with the dura.

Chemotherapy and adequate draining of the local infection and its intracranial and intracerebral extension is the treatment recommended.

George Perret, M.D.

Rathke's Cleft and Its Cysts. M. L. Bayoumi. *Edinburgh M. J.*, 1948, 55: 745.

This article deals with the incidence and histology of Rathke's cleft and its cysts and is based on a study of 200 pituitary glands that were collected from autopsy cases of the Neuropathology Department, Royal Infirmary, Edinburgh. As a routine

procedure, the glands were divided sagittally into two halves. Fixation was carried out in Helly's fluid, formalin, or alcohol. Frozen sections were cut when necessary. The rest of the glands were embedded in paraffin. Serial sections were cut at 6 micra. Two sections were mounted at every one hundred and sixty-sixth cutting. One section was stained with hematoxylin eosin and the other kept for further use. Sudan III and Mayer's mucicarmine stains were used to demonstrate fat and mucin, respectively.

The author noted a distended cleft separating the anterior lobe from the rest of the gland through the whole length of the sagittal plane in 26 of 200 cases (13 per cent).

With regard to the structure of Rathke's cleft cysts, the cyst is lined in parts by tall columnar mucus-secreting epithelial cells possessing numerous delicate cilia. The nuclei are small, rounded, and deeply stained, and lie at the bases of the cells. The ciliated epithelial cells are especially noticeable at the upper and posterior part of the cyst wall. They are invariably visible on serial sectioning. In other parts of the cyst wall, the epithelial lining has become compressed, flattened, and has lost its cilia. The cysts usually contain one or more of the following elements:

1. Large foam cells with granular swollen cytoplasm and pyknotic excentric nuclei. Fat stains are negative, while the mucicarmine is positive, which indicates that the cells are derived from degenerating desquamated epithelium.
2. Cholesterol crystals.
3. Mucinous material and granular debris with remains of disintegrated pyknotic nuclei.

Rathke's cleft cysts may enlarge to such an extent as to give rise to symptoms. Clinically, they are identical with the hypophysial duct tumors (craniopharyngioma) arising from the lower group of epithelial rests at the root of the stalk. Histologically, these cysts form a separate entity from the epidermoid tumors.

The differentiation of Rathke's cleft tumors from other congenital neoplasms of the hypophysis on histogenetic evidence is discussed and verified.

HOWARD H. LANDER, M.D.

Tuberous Sclerosis with Cerebral Neoplasm. J. C. PARR. *N. Zealand M. J.*, 1948, 47: 550.

Tuberous sclerosis is an uncommon hereditary disease usually manifesting itself in infancy or early childhood and is characterized by defective mentality, progressive epilepsy, and a facial rash called adenoma sebaceum. The latter is a reddish or skin-colored papulelike growth distributed in "butterfly" fashion over the face. Occasionally associated retinal tumors are found. Although no symptoms may have resulted from their presence, autopsy often reveals affection of other organs, such as hypernephromas and cardiac rhabdomyomas.

The authors presented a case report of a 43 year old male who had been a successful farmer until recently when he had a sudden change in mentality and personality. Past history revealed that he had convulsions as a baby, and a rash on his face had been present since boyhood. His mother, who had always enjoyed good health, had a similar rash. Funduscopic examination revealed numerous pearly white nodules in the retina and papilledema. Ventriculography was done. The third ventricle was filled only in its upper portion and displaced to the right. The left lateral ventricle was displaced upward. The lateral ventricles were enlarged and a space-occupying lesion in the thalamus on the left was suggested. Treatment consisted of ventriculocysternostomy followed by deep x-ray therapy. Thereafter, his papilledema subsided and his condition was improved generally, but he remained slow and listless.

DANIEL RUGE, M.D.

Massive Intraventricular Epidermoid. Review of the Literature and Report of a Case. HOWARD W. DUEKER and J. MA. SANCHEZ-PEREZ. *Bull. Los Angeles Neur. Soc.*, 1948, 13: 220.

Another case is added to reports in the literature of approximately 200 intracranial epidermoids. The authors review the case of a male, 47 years of age, who complained of unusual fatigue and nervousness of 10 years' duration. For 20 years the patient had occasional generalized convulsive seizures accompanied by unconsciousness. Physical examination revealed left homonymous hemianopia, minimal left spastic hemiparesis, and mental confusion. Electroencephalography, pneumoencephalography, cerebral angiography, spinal fluid examination, and ventriculography were done and showed abnormalities compatible with a space-occupying lesion on the right side. An osteoplastic flap was turned in the parietal region but the tumor was not located. The patient expired on the first postoperative day. Postmortem examination revealed a tumor, 7.1 cm. by 4.3 cm., occupying the posterior half of the right lateral ventricle.

According to the authors the ventriculograms and, to a lesser extent, the angiograms and the electroencephalogram served, in retrospect, to accurately outline this epidermoid tumor. Ventriculograms and photographs of the coronal sections of the brain containing the specimen are reproduced.

The review of the literature is very brief, the majority of the paper being devoted to the case history, laboratory findings, and postmortem examination of the brain.

JOHN L. BELL, M.D.

Fetal Cell Adenomas of the Hypophysis Cerebri. M. L. BAYOUMI. *Edinburgh M. J.*, 1948, 55: 750.

A study of the adenomas of the human hypophysis and their classification on a histogenetic basis reveals a group of tumors arising from embryonic cells. These neoplasms form a special entity with a characteristic morphological picture.

The material studied consisted of two groups. The first group comprised 105 cases of hypophysial chromophobe adenomas removed surgically.

The second group comprised 200 hypophyses collected without selection from the autopsies of the Neuropathology Department of the Royal Infirmary, Edinburgh.

There are no particular naked eye features to distinguish the various types of the chromophobe adenomas from one another. Comparatively, the fetal cell adenomas are less vascular than the ordinary type of chromophobe adenomas. Again, the tumor does not exhibit any special predilection to extrasellar extension or any particular behavior different from that of the chief cell type. The histologic appearance of these tumors is described in detail.

Of the 105 chromophobe adenomas 38 tumors contained these highly undifferentiated columnar cells. Fifteen tumors were composed totally of these cells, while the rest were a mixture of chief and fetal cells (22 cases) or transitional and fetal cells (1 case).

The importance of the recognition of the fetal cell adenomas becomes obvious when the duration of the chromophobic adenomas is studied in correlation with the cell type.

The majority of the fetal cell adenomas (10 of 15) or tumors containing fetal cells (16 of 23) have a duration period of less than 5 years. Again, about 55 per cent of the tumors with a duration period of less than 1 year are of the fetal cell type. The incidence of the fetal cells in the hypophysial chromophobe adenomas that have a duration period above 3 years diminishes to nearly one-third in these cases.

The recognition of a group of clinical adenomas histogenetically related to these embryonic cells is ascertained and the microscopic picture is fully described with illustrations.

HOWARD H. LANDER, M.D.

Ligation of the Carotid Arteries for Advanced Malignant Neoplasms of the Head and Neck. ALLISON J. VOSSELER and BERNARD J. FICARRA. *Arch. Surg.*, 1949, 58: 35.

Ligation of the major arteries of the neck may become necessary in the treatment of eroding neoplasms of the head and neck. Either the common carotid artery or the external carotid artery may be ligated. This procedure has been advocated as a prophylaxis against great bleeding during radical surgical procedures on the head or neck and to diminish the blood supply to inoperable neoplastic lesions in the hope of decreasing the tumor growth.

The authors stress the importance of preparing the patient for surgical ligation by gradually compressing the carotid artery for periods up to 10 minutes, with careful attention to the appearance of unusual symptoms. They reported on 26 patients operated upon at the Brooklyn Cancer Institute, Brooklyn, New York. Pathological conditions consisted of carcinomas of the floor of the mouth, tongue, alveolar ridge, buccal mucosa, lip, tonsil, angle of the mouth, larynx, and hypopharynx, fibrosarcoma of the neck, giant cell tumor of the mandible, and adamantinoma of the mandible and maxilla. The patients were all poor operative risks. Twenty-one of the 26 survived for periods ranging from several weeks to 3 years.

DANIEL RUGE, M.D.

Trigeminal Tractotomy: Observations on 48 Cases. WALLACE B. HAMBY, BURTON M. SHINNERS, and INA A. MARSH. *Arch. Surg.*, 1948, 57: 171.

This interesting and instructive report concerns 48 medullary (trigeminal) tractotomies done by the authors between 1939 and 1947. Thirty-five operations were for trigeminal neuralgia; in 28 patients the pain involved the first division, in 6 a previous rhizotomy had been performed, and in 1 patient the pain was bilateral. The mortality was 5.7 per cent in this group. In 13 cases combined trigeminal and other rhizotomies with trigeminal tractotomy were done for neoplasms causing intractable pain. In this group the hospital mortality was 46 per cent, 3 deaths being complicated by aspiration pneumonia which was partly due to the position of the malignant growth.

A follow-up study was attempted on the patients with trigeminal neuralgia. Only 10 patients had been free from pain since the operation, 11 had bearable pain, 7 patients were unrelieved of neuralgia and 6 of these were subjected to trigeminal rhizotomy, 5 were untraced, and 2 had died in the hospital. Several observations were made on the neurological signs in patients examined: for instance, 8 of 24 had some residual ataxia; 12 of 28 patients had residual dysesthesias of the face with residual pain in 7 and without such pain in 5. The dysesthesias were of the obsessive kind seen after rhizotomy. There is a discussion of the "onion skin" pattern of sensation in the face to which the authors are inclined to give some support.

A specific attempt was made to determine whether other cranial nerve areas were involved in the analgesia in 5 patients, and in 3 of these the anesthesia involved the entire ipsilateral half of the tongue, palate, uvula, the tonsil and its pillars, and the accessible part of the pharynx. These 3 patients were free from pain. Two of the 5 were readmitted to the hospital because of persistent pain; both retained most of their pain perception in the tongue, palate, fauces, and pharynx. The level of the incision in the medulla did not appear to be the determining factor because in 4 cases the incision into the tract was made 10 mm. below the obex and in 1 case it was made at the level of the lowest vagal rootlet. The article is simply a statement of the postoperative findings, the significance of which are left to the reader.

ADRIEN VER BRUGGHEN, M.D.

Tumors of the Acoustic Nerve. Clinicosurgical Considerations of 250 Cases (Tumores del nervio acústico. Consideraciones clinicoquirúrgicas sobre 250 casos). HERBERT OLIVECRONA and ALFREDO GIVRÉ. *Prensa méd. argent.*, 1949, 36: 262.

Among 3,256 brain tumors, there were 296 acoustic neurinomas, 9.1 per cent of the entire material. The average age of the patients was 45.5 years and the duration of the disease, 5.1 years. There was no

marked difference between the number of the tumors located on the right or the left side. Sixty-two per cent of all the patients were women. A trauma of the skull preceding the development of the tumor was recorded in 18 instances, but it could not be interpreted as the direct cause of the tumor formation. In 46 per cent of all cases the chronologic appearance of the symptoms followed the theory of Cushing. In 59 per cent functional disturbances of the eighth nerve were the first signs. In 15 cases neuralgia of the fifth nerve initiated the symptoms. Normal hearing was recorded in only 5 cases. Tinnitus was present in 52 per cent of the entire group, while labyrinthian disturbances were recorded in 236 cases. Nystagmus was found in 94.4 per cent. It was found necessary to carry out the test with the head in various positions because in this manner nystagmus was discovered in an additional 14 per cent of cases (in addition to the cases of spontaneous nystagmus).

The corneal reflex was absent in 90 per cent of the patients. Headaches were recorded in 75 per cent and nausea and vomiting in 50 per cent. Papilledema was present in 74 per cent, and atrophy of the papilla in 6 per cent. Visual impairment was found in 73 per cent and abnormal visual fields in 70 per cent.

The facial nerve showed abnormalities of function in 65 per cent of the patients, and the taste in the anterior two-thirds of the tongue was affected in 73 patients. Neuralgia of the ninth nerve was present in 12 patients, while nerve symptoms related to the tenth, eleventh, and twelfth nerves were found in approximately 10 per cent of the patients.

Cerebellar signs, such as disturbances of the equilibrium or the gait, ataxia, and Romberg's sign, became manifest in 80 per cent of the entire group. Psychic disturbances were noticed in 25 patients and aphasia in 11.

X-ray films disclosed signs of a cerebellopontine tumor in 189 patients. Twenty-six ventriculograms were made, showing 23 positive results: namely, (1) elevation of the floor of the third ventricle, (2) lateral and posterior deviation of the aqueduct, and (3) obstruction of the aqueduct with dilatation of its proximal portion. JOSEPH K. NARAT, M.D.

SPINAL CORD AND ITS COVERINGS

Vertebral Angiography. OSCAR SUGAR, LAWRENCE B. HOLDEN, and CHESTER B. POWELL. *Am. J. Roentg.*, 1949, 61: 166.

The authors describe a new, percutaneous technique for vertebral angiography. This method was used in more than 20 patients, with good visualization in all but 2 of the earlier tests. The principle of injection lies in the direct insertion of the needle to the transverse process of the fifth cervical vertebra with the patient in the supine position and his cervical spine extended. The needle is inserted about 1 cm. mesial to the tip of the transverse process laterally, and then advanced cautiously over the anterosuperior margin of the process, and under the anteroinferior margin of the transverse process above. It passes into the foramen, and usually engages the vertebral artery. When this has been accomplished, injection is made in the usual manner with 20 c.c. of 35 per cent diodrast, and x-ray films are taken in the transverse and the anteroposterior planes.

The authors describe the circulation of the vertebral and basilar arteries and their branches, and furnish angiographic films for illustrations.

Five case reports are included, and 2 of these demonstrate basilar aneurysm, pictured for the first time antemortem without operation.

The historical development of vertebral angiography is reviewed, and a survey of recent publications on aneurysm and the posterior intracranial circulation is made.

In addition the indications for, and complications of this procedure are described.

HOWARD A. BROWN, M.D.

PERIPHERAL NERVES

Cervical Plexus Injuries. A. SUTCLIFFE KERR. *J. Bone Surg.*, 1949, 31-B: 37.

The author describes 2 cases of severe traction injury of the brachial plexus with marked motor and sensory changes. In both cases recovery was complete, except for a slight paresis in one patient. Originally the sensory changes extended into the second, third, and fourth cervical dermatomes with anhydrosis in those areas as well as transient paresis in the muscles supplied by the cervical plexus.

The author theorizes that perhaps the local contusion of the sensory portions of the cervical plexus as they emerge from the deep cervical fascia might be the cause of such change in the cervical plexus after traction injury. Certainly, in these 2 patients the traction on the brachial plexus was definitely accomplished by a similar traction of the cervical plexus, and the author feels that it is unusual that more such information of cervical plexus involvement is not reported in the literature since the injury is, of course, a common one. JOHN MARTIN, M.D.

Resection of the Clavicle in Lesions of the Cervical Plexus (La resezione delle clavicola nelle lesioni del plesso cervicale). G. MORANDI. *Chir. org. movim.*, 1948, 32: 336.

In 1941 Scaglietti of the V. Putti Center for Cripples and for Orthopedic Surgery noted an aggravation of the pain symptomatology in 1 of his patients subjected to clavicular osteotomy for brachial plexus injury. At reoperation an exuberant callus from the osteotomy wound, pressing on the nerve roots, was found. Since then, at this Center, 19 cases of cervical plexus injury of various types have seemed to indicate some form of operative solution of continuity of the clavicle in order to gain a better exposure of the operative field and to shorten the distance between the shoulder and the chest. This would make suturing easier and the healing of the

suture less subject to tension. In 16 of these a portion of the clavicle was resected.

The experience at the Center with this resection has been that in cases of extensive destruction of all or a great part of the elements of the brachial plexus, such as those with complicating fracture and osteomyelitis, in which the resultant cicatricial development has been excessive, the better exposure of the field of operation will shorten the time of operation materially. In some cases of short-necked and fat individuals proper exposure cannot be obtained without it. In the cases of interruption of the seventh and eighth cervical and first dorsal roots the necessary suture would be impossible without approaching the shoulder to the trunk.

The simple cutting through of the clavicle, even when placed toward the inner or outer end of this bone, will, as a rule, result in overriding and the development of abundant callus which will bring the menace of later pressure on the plexus.

The clavicle is a rudimentary bone and its functioning will be taken over satisfactorily by the associated musculoligamentous complex of the shoulder. The absence of the clavicular bone will not leave any particular deformity or false posture of the arm. There may possibly remain a slight lowering of the shoulder in comparison with the other side and a slight narrowing, but these will not noticeably show through the ordinary clothing.

Six photographs are appended, showing the insignificant character of the resultant deformity from 2 to 5 years after the operation. Some of these illustrate a regaining of function in the extremity supplied by the injured plexus, which suggests an actual advantage gained by the procedure.

JOHN W. BRENNAN, M.D.

Traction Injuries of the Brachial Plexus in Adults. ROLAND BARNES. *J. Bone Surg.*, 1949, 31-B: 10.

The author presents a review of 63 cases of closed injuries of the brachial plexus in patients who were treated in British peripheral nerve injury centers during the war. Most of these traction injuries occurred as the result of motorcycle accidents, in which forcible separation of the head and shoulder was the main factor. Thirteen injuries were classed as nondegenerative lesions. In degenerative lesions the pattern of recovery was fairly constant; lesions of the three upper roots recovered well; and lesions of the entire plexus did not completely recover.

Rupture of nerve roots with complete separation of the torn ends occurred only rarely in this series, as verified by operative exploration. The main damage to the plexus was intraneural. When rupture of nerves was encountered, it was impossible to perform satisfactory end-to-end suture after adequate resection of the scarred stumps. Horner's syndrome is considered a grave prognostic sign indicating irreparable injury of the lower roots and often of the entire plexus.

The author advocates conservative, nonoperative treatment for this type of injury of the plexus. Because the chief barrier to regeneration was found to be intraneural scarring, early or late explorative operation was not deemed justifiable except for the relief of pain in selected instances. According to the author, reconstructive procedures to improve the function of the limb after the extent of recovery has been established should not be considered earlier than 15 months after injury. An extensive routine of physical therapy is advocated for patients with traction injuries of the brachial plexus.

JOHN L. BELL, M.D.

Late Spinal Paralysis after Avulsion of the Brachial Plexus. WILDER PENFIELD. *J. Bone Surg.*, 1949, 31-B: 40.

This unusual case presentation is that of a man who, as a boy, suffered a severe traction-avulsion injury of the brachial plexus, during which accident the extremity was completely avulsed. The patient recovered without any immediate spinal cord paralysis, and lived to die of cardiac disease at the age of 65.

In early adult life he began to show some evidence of cord involvement, mainly on the right side (the side of his injury), and he had evidence of cervical autonomic involvement on this side. He was subjected to a laminectomy at the age of 60, and it was found that the cord was angulated sharply and pulled out into the first thoracic intervertebral foramen on the right. It was believed that not only had the original injury pulled the cord over, because of traction on the root, but that the cord had, by the gradual process of scar formation, been pulled slowly into this enlarged foramen.

The right first thoracic nerve was cut across, and the cord moved back toward the midline of the vertebral canal into its normal position. The cord was, surprisingly enough, found not to be particularly atrophied, even after being out of its proper position for such a long time in the presence of surrounding scar tissue.

JOHN MARTIN, M.D.

Treatment of Residual Paralysis—Brachial Plexus Injuries. A. M. HENDRY. *J. Bone Surg.*, 1949, 31-B, 42.

In the present article the author makes a plea for the preservation of the patient's own upper extremity after severe paralysis following brachial plexus injury, rather than the use of amputation and an artificial limb.

The important point is made that even though the patient requests amputation of the apparently useless extremity, he should be prevailed upon to try less radical methods to preserve his arm by such reconstructive surgery as might be suited to his case.

The author has considered the severe paralysis following brachial plexus injury according to the functional levels of the extremity—that is, the hand, wrist, forearm, elbow, and shoulder—and case reports are given to illustrate his approach to the problem in the various levels. He feels that when nerve repair is impossible, the transposition of muscles which are still functioning or likely to regain func-

tion must be carefully considered and worked with. Very frequently a well chosen arthrodesis will place the extremity, or part of it, in at least a semifunctioning position. He points out that even a flail-like hand can thus be placed into some semblance of a functional position, and that an elbow which hangs fully extended causes incapacity of the extremity. Again, transposition of the proper muscles or the placement of a bone-block behind the elbow, permitting initial flexion, will greatly improve the weight-carrying angle. It is believed that arthrodesis of the shoulder joint should be the last treatment of a paralyzed upper limb; however, when indicated, arthrodesis of the shoulder may add greatly to the rehabilitation of the extremity. JOHN MARTIN, M.D.

An Operative Approach to Supraclavicular Plexus Injuries. J. E. BATEMAN. *J. Bone Surg.*, 1949, 31-B: 34.

In the treatment of 21 patients requiring supraclavicular exploration of the brachial plexus following injury, the author's operative approach was different from the classical supine position. He advocates the sitting position with the head rotated away from the injured side and the shoulder in the dependent position.

The procedure is as follows:

A vertical incision is made, extending from the midpoint of the lateral border of the sternocleidomastoid to the middle third of the clavicle; the external jugular vein is ligated; following retraction of the sternocleidomastoid, the omohyoid muscle is divided; the suprascapular and transverse cervical vessels are ligated, following which the brachial plexus is exposed. Although seldom necessary in the present series, further exposure may be attained by division and retraction of the clavicle. As the clavicle is pulled down by the dependent shoulder, it is possible to explore a larger field from above, and the structures of the plexus remain more superficial than when the supine position is employed.

JOHN L. BELL, M.D.

The Surgical Routes in High Lesions of the Sciatic Nerve (Le vie chirurgiche nelle lesioni alte dello sciatico). G. MORANDI. *Chir. org. movim.*, 1948, 32: 383.

Basically, four routes have been proposed to expose the anatomic lesion of the high portion of the sciatic nerve.

1. A longitudinal incision perpendicular to the course of the nerve from its origin to the upper third of the thigh, also called Foerster's longitudinal incision on the median line. It involves the skin, subcutaneous tissue, aponeuroses, gluteus maximus, and origin of the femoral biceps muscle, and provides good visibility of the nerve, but forces the surgeon to operate on a deep plane which, especially in obese subjects, makes the surgical manipulations of the nerve difficult.

2. Iselin's incision follows the lateral border of the gluteus maximus from the iliac crest down and runs for a few centimeters on the median line between the great trochanter and the ischiatic tuberosity. It cuts the skin, subcutaneous tissue, and aponeurotic fascia, and detaches the insertion of the gluteus maximus or, if the lesion is very high, respects the lower two-thirds of the insertion. Medial retraction of the flap exposes the sciatic nerve from the piriform muscle to the femoral biceps.

3. The incision of Toennis begins at the level of the posterosuperior iliac spine and runs along the medial border of the buttock to the intergluteal sulcus in the form of a reversed question mark to join the median line between the great trochanter and the ischiatic tuberosity, from where it descends on the thigh for a few centimeters. It cuts the skin, subcutaneous tissue, part of the upper insertion, and then the muscular tissue of the gluteus maximus lower down. Lateral retraction of the flap exposes the apparent origin of the sciatic nerve down to the gluteal fold, and removal of part of the sacral ala exposes the roots of the nerve.

4. The oblique incision following the course of the fibers of the gluteus maximus begins at the level of the great trochanter and allows separation of the muscle bundles to reach the sciatic nerve which crosses the operative field. It exposes only a small portion of the nerve and is impractical because the surgeon has to work in a deep groove in which vision is poor.

On the basis of 58 firearm lesions of the sciatic nerve involving the portion between its apparent origin and the upper third of the thigh, which were operated upon, the author draws the following conclusions:

In lesions at the limit or immediately below the lower bundles of the gluteus maximus, the median incision at the upper third of the thigh associated with partial section of the lower muscular bundles of the gluteus is indicated. When the lesion is between the apparent origin of the nerve and the lower limit of the gluteal mass, Iselin's incision with distal detachment of the gluteus maximus is used. In lesions involving the roots of the nerve, the Toennis incision with removal of part of the sacral and iliac ala is indicated. In all cases in which the gluteus has been detached proximally (Toennis) or distally (Iselin) or cut in the median line, the region must be put at rest by the use of a hip plaster cast which is removed after 30 days unless the nature of the operation on the nerve (suture) requires 45 days; this will allow the formation of a solid scar for the gluteal muscle and a return to normal conditions.

RICHARD KEMEL, M.D.

MISCELLANEOUS

Preoperative and Postoperative Care in Neurosurgery (Cuidados preoperatorios y postoperatorios, en neurocirugía). RAMÓN DEL CUETO, JR. *Aisa* 1949, No. 29: 1912.

With the exception of the surgery of the heart, blood vessels, and lungs, there is no field of surgery

in which the preoperative and postoperative care is as important as in neurosurgery.

In patients with brain tumors or abscesses the intake of fluids before the operation should be limited to 1,500 or 2,000 c.c. to prevent cerebral edema. For the same reason venoclysis is contraindicated and should be replaced by hypodermoclysis in dehydrated patients. Mild laxatives, small enemas, or suppositories should be given for constipation, but cathartics should be avoided. Cough should be combated to avoid an increase in the intracranial pressure. For the same reason cesarean section is indicated in a pregnant woman with a brain tumor. Luminal, bromides, or paraldehyde should be prescribed for patients with convulsions. A relatively long period of hospitalization before the operation is desirable to observe the appearance of somnolence, stupor, mental confusion, vomiting, and diminution of vision, and to register periodically the pulse, respiration, blood pressure, as well as the temperature.

Patients with hypertension are given intravenous injections of 100 to 150 c.c. of 50 per cent glucose solution every 4 to 6 hours. If a more prolonged effect is desired, a 50 per cent saccharose solution may be used because its excretion is slower than that of glucose. Hypertonic solutions of magnesium sulfate are given to reduce intracranial hypertension. This solution is administered per rectum, 20 drops per minute.

Patients with considerable hypertension and somnolence are given 1 mgm. of atropine one hour before the operation. If the hypertension is moderate, 0.01 gm. of morphine may be added. Although the last mentioned drug depresses the respiratory center, it is employed by the author in selected cases to provide the necessary sedation, especially if local anesthesia is used. If the excitation in the course of the operation is marked, from 0.003 to 0.005 gm. of morphine may be administered intravenously.

After the operation, patients with brain tumors should assume a sitting or semisitting position to diminish the intracranial pressure and to facilitate the venous circulation. The position of the patient operated on under local anesthesia should be changed frequently. Nasopharyngeal or laryngotracheal aspirations may be required to keep the airways open. In patients with cerebellopontine tumors who have signs of a lesion of the ninth or tenth nerve, a tracheotomy may be necessary. Bronchoscopy is indicated if signs of pulmonary atelectasis appear. Gavage may be preferable to the intravenous administration of fluids, which should be done through a nasal tube, drop by drop, to prevent distention of the stomach and vomiting.

If Foley's catheter must be employed for the treatment of urinary retention, sulfadiazine should be given prophylactically.

Dilantin or luminal sodium should be given to combat postoperative convulsions.

To control intracranial hypertension, the author prefers the introduction of a Nélaton catheter into each lateral ventricle to repeated ventricular punctures.

Alcohol rubs, aspirin, and cold water retention enemas are used to diminish the hyperthermia frequently observed after the removal of tumors located in the median line, such as neoplasms of the hypophysis, pineal body, third ventricle, or the cerebellar worm.

Paraldehyde and bromides are valuable sedatives in the treatment of skull injuries. Barbiturates are not very efficient unless given in large doses; only sodium amytal, given intravenously, forms an exception. Large doses of morphine should be avoided.

JOSEPH K. NARAT, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Mammary Lipoma. C. G. TEDESCHI. *Arch. Path.*, Chic., 1948, 46: 386.

Fatty tumors of the breast are rare. Among the 274 conditions of the breast requiring surgical intervention at the Framingham Union Hospital, Framingham, Massachusetts, during the past 10 years, 12 were fat tissue necrosis and 1 of these was liposarcoma; thus 4.6 per cent were lipid growths. Eleven occurred in females and 1 in a male. The greatest incidence was in the fourth and fifth decades. In only 2 cases was there any possible relationship to previous trauma. In each of the 12 cases, the fatty tumor was the only pathologic condition seen in the breast. The apparent duration of these 12 tumors varied from 3 weeks to 5 years. In 5 cases the site was in the right breast and in 7, the left breast; in 2 cases a multiplicity of growths were seen. The upper outer quadrant was the most frequent site (8 cases). In 8 cases, the tumor or tumors were encapsulated, and in 6 there were no capsules.

Classified microscopically there was:

1. Mature and well differentiated fat tissue (5 cases)
2. Mature fat tissue with foci of cellularity (2 cases)
3. Involutional changes in well differentiated fat tissue (2 cases)
4. Mature fat and glandular tissue (3 cases)
5. Mature fat tissue and fibrous connective tissue (1 case)
6. Liposarcoma (1 case)

The simplest way to classify fatty tumors of the breast is on the basis of topographic and gross criteria, by which they are divided into four broad types: encapsulated tumors, tumors which arise in the fatty framework of the breast itself, retromammary tumors, and subcutaneous tumors.

FRANK B. QUEEN, M.D.

Carcinoma of the Male Mammary Gland (Carcinoma della ghiandola mammaria maschile). FRANCO LOBELLO. *Gior. ital. chir.*, 1949, 5: 108.

Two cases of cancer of the male breast are reported. One of the patients was a 70 year old laborer who had noted enlargement of the right mammary gland some months previously, but the growth had been slow until 2 months before he was seen by the author when the enlargement became rapid following severe trauma to this breast. The operation with exeresis of the enlarged right axillary glands (Halsted) was well tolerated and healing occurred per primam.

Even more interesting was the second case, that of a 45 year old cobbler who had been experiencing a progressive loss of sexual desire for the past 5 years and whose testicles at the time of examination were atrophied. Both breasts of this patient contained tumors. The tumor in the right gland was centrally located and was the larger of the two; the axillary glands on this side were enlarged. The tumor on the left side was located in the upper outer region of the gland, but there was no evidence of enlargement of the left axillary lymph glands. The Halsted operation was done on both sides at one sitting. Two years have elapsed since the operation without evidence of recurrence or metastasis. In this patient the operation was followed by adequate treatment with testosterone. There was no history of trauma, but the occupation of the patient suggested frequent microtraumas incident to cobbling.

Neither of these tumors was of the scirrhous type; the first was an alveolar epithelioma and the second, a tubular epithelioma. JOHN W. BRENNAN, M.D.

Hormone Treatment of Inoperable Carcinoma of the Breast (Ueber die hormonale Behandlung des inoperablen Mammakrebses). F. LINDER. *Chirurg*, 1948, 19: 500.

It must be acknowledged at the outset that the hormonal treatment of carcinoma of the breast does not afford the good results frequently seen in the similar treatment of carcinoma of the prostate. However, even though suppression of the primary malignant growth may not occur in breast carcinoma, the metastases to bone and the pain they produce can be successfully controlled for several months by the use of hormone therapy.

The best results are obtained in the hormonal treatment of carcinoma of the breast when the component cells of the malignancy are of the well differentiated type. In the anaplastic type of carcinoma one can expect little or no beneficial effect from hormone treatment. When the malignancy is composed of immature cells of mesenchymal origin, such as are found in the sarcomas, hormonal treatment is of no value. ORVILLE F. GRIMES, M.D.

Researches on the Microscopic Metastases of the Supraclavicular Lymph Nodes in Breast Carcinoma. Histologic Studies of 98 Cases of Radical Operation (Recherches sur les métastases microscopiques des ganglions lymphatiques sus-claviculaires dans le cancer du sein). M. ANDREASSEN and E. DAHL-IVERSEN. *J. internat. chir.*, Brux., 1949, 9: 27.

Ninety-eight cases of cancer of the breast were treated by radical operation and preventive dissection of the glands in the supraclavicular fossa by means of an incision parallel to the clavicle. Microscopic metastases were found in the glands of this region in 17 per cent of all the cases, and in 33 per cent of the cases with metastases in the axillary glands. In the cases with no axillary glandular involvement, no single instance of supraclavicular glandular involvement was found. The authors have

concluded that until a further examination of this material can be carried out in 5 years' time, the supraclavicular glands should be removed with the axillary group of glands when the latter are seen to be macroscopically invaded. In contradistinction, the authors state that removal of supraclavicular glands is not necessary in the absence of any axillary glandular involvement.

In 2 previous series of investigations, practically speaking, the same incidence of recurrence in the supraclavicular glands was found as in this present series, in which microscopic metastases were found after the preventive removal.

The great question to decide is whether microscopic metastases of the supraclavicular glands should be judged in the same light as clinically established supraclavicular glandular involvement; that is to say that the case is inoperable and that consequently the removal of the supraclavicular group of glands is unnecessary. This question will be answered by subsequent examinations.

TRACHEA, LUNGS, AND PLEURA

Practical Correlative Anatomy of the Bronchial Tree and Lungs. JOHN FRANKLIN HUBER. *J. Nat. M. Ass.*, 1949, 41: 49.

The lung, in its ultimate analysis, is the total branching of the bronchus leading to the lung. As the main bronchus gives off a branch going to a lobe, the lobe can be considered as the total branching of the bronchus going to it. Each branch of the bronchus entering a lobe divides to form a definite portion of that lobe. Thus, there are three branches of the right upper lobe bronchus, and the total branching of each of these branches forms a definite portion of the right upper lobe, so that the right upper lobe is divided into three parts on the basis of the bronchial distribution. The name bronchopulmonary segment is commonly used for the portion of lung substance which is the total branching of a bronchus.

Based on this concept, the lungs may be divided into the following segments:

Right lung		Left lung	
Lobes	Segments	Lobes	Segments
Upper	Apical	Upper	Upper division: Apical posterior
	Posterior		Upper division: Anterior
	Anterior		Lower lingular division: Superior
Middle	Lateral		Lower lingular division: Inferior
	Medial		
Lower	Superior	Lower	Superior
	Medial basal		Anterior medial basal
	Anterior basal		Lateral basal
	Lateral basal		Posterior basal
	Posterior basal		

The subdivisions of the lung having thus been named, the bronchus is named according to the subdivision of the lung to which it goes.

This concept of bronchial branching and related subdivision of the lung is of clinical importance. A bronchoscopist is immediately able to relate the bronchial orifice he sees to a definite portion of the lung. The radiologist can more specifically locate the abnormality he finds. The thoracic surgeon can do a segmental resection rather than a lobectomy.

The question of the predilection of disease for certain segments requires much study. Thus, the posterior segment of the upper lobe is a favorite for tuberculosis. Lung abscess is apt to appear in the superior segment of the lower lobe or in adjacent parts of the anterior and posterior segments of the upper lobe. Bronchiectasis commonly involves the lower lobe, the adjacent part of the middle lobe on the right side, and the lower or lingular division of the upper lobe on the left. Pneumonia may have a slight predilection for the superior segment of the lower lobe. SAMUEL KAHN, M.D.

Bronchostenosis of Inflammatory Origin, with a Report of 6 Cases. H. F. FABRITIUS AND H. ØDEGAARD. *Acta radiol.*, Stockh., 1948, 30: 385.

Bronchial obstruction is believed to be the commonest cause of atelectasis. Obstruction of the lumen, changes in the bronchial wall, or extrabronchial compression may occur. The changes in the bronchial wall may be inflammatory or neoplastic. In the present article the authors deal with obstruction due to inflammation.

Six cases of bronchial stenosis with associated peripheral changes in the lung are reported. In all of these patients the stricture was caused by local inflammation. The condition was verified by roentgenography and bronchoscopy in each case. All patients gave a history of prolonged bronchial symptoms. In 1 case the inflammation originated around a foreign body; in 2 cases the tuberculous bacillus was demonstrated, but after extirpation no evidence of tuberculosis was found. The author points out that chronic bronchitis may mask a bronchostenosis caused by localized inflammation in a bronchus. ROBERT E. FLORER, M.D.

A Case of Arteriovenous Aneurysm of the Lung Cured by Resection. OLAF BRØBECK. *Acta radiol.*, Stockh., 1948, 30: 371.

The clinical characteristics of arteriovenous aneurysm of the lung are cyanosis, polycythemia, clubbing of fingers, and x-ray findings. Other clinical findings are dyspnea and fatigue, small hemangiomas of the skin, and a murmur over the aneurysm. In this condition some blood passes through the pulmonary circulation without having been oxygenated. On x-ray examination, a small or large rounded shadow is seen in the lung field and sometimes pulsation may be observed by fluoroscopy. A more characteristic finding is that the shadow is connected with the hilar region by broad sinuous densities. A case is presented of a 34 year old woman with a history of cyanosis and dyspnea since childhood. She was poorly nourished; there were many superficial angiomas on the face; there was stasis of the veins of the neck and brow, and clubbing of the fingers. On x-ray examination, a dense, well defined shadow was ob-

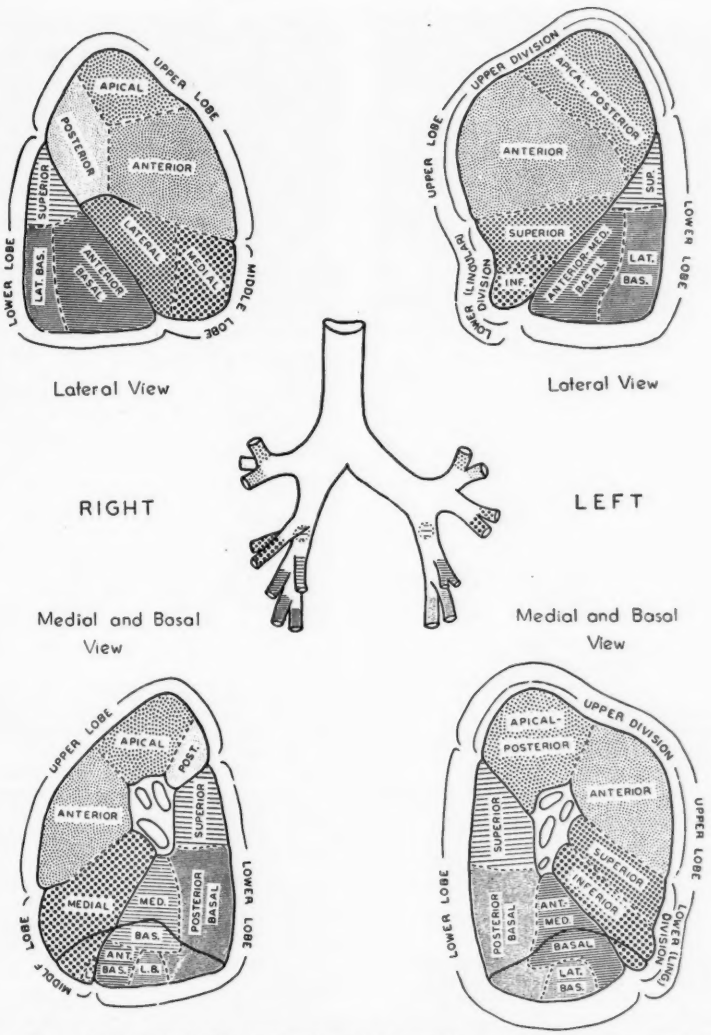


Fig. 1 (J. F. Huber). The tracheobronchial branching as far as the "segmental" bronchi correlated with the subdivision of the lungs on the basis of bronchial distribution. The terminology used is that suggested by Jackson and Huber. Because of insufficient space the word "segment" was omitted in each case from the labelling of the segments. The symbols in each bronchus indicate which segment it branches out to form. Each bronchial branch should be designated by the name of the subdivision of the lung supplied by it.

served in the left lower lung field near the cardiac shadow. Pulsation of the tumor could not be demonstrated by fluoroscopy.

On thoracic exploration it was found that anteriorly in the lower lobe there was apparently a sac the size of a large walnut which was so thin-walled that the blood could be seen passing through it. This sac was seen to be connected with the lingula where it continued in a much larger thin-walled sac. The sac entered the inferior pulmonary vein. The aneurysm was resected. The postoperative course was uneventful.

ROBERT E. FLORER, M.D.

Streptomycin as an Adjunct in the Surgical Treatment of Pulmonary Tuberculosis. DANIEL A. MULVIHILL, LAURENCE MISCALL, ROBERT KLOPSTOCK, and JOSEPH BITSACK. *J. Thorac. Surg.*, 1949, 18: 1.

The authors' experience with streptomycin as an adjunct in the surgical treatment of pulmonary tuberculosis in the Triboro Hospital, Jamaica, Long Island, during the year 1947 is presented. The results in 65 cases of pulmonary, pleural, and chest-wall tuberculosis treated with streptomycin are summarized, and case histories typical of each group are cited. Twenty additional thoracoplasty patients who had not received streptomycin are included as controls. The efficacy of preoperative and postoperative streptomycin treatment in the prevention of postoperative complications in pulmonary resection for tuberculosis and thoracoplasty is evident. Beneficial effects of topical application of the drug in combination with open operations for bronchopleural fistulas and residual tuberculous empyema spaces are outlined. The dosage, mode of administration of the drug, and toxic reaction are reviewed.

In the authors' experience, streptomycin has been a most valuable adjunct in the surgical treatment of pulmonary tuberculosis, and has proved efficacious for the following indications:

1. Preoperatively and postoperatively for all pulmonary resections and intrapleural surgery on tuberculosis patients.
2. Preoperatively and postoperatively for all thoracoplastics considered substandard risks, or with complications such as contralateral pneumothorax, diabetes, etc.
3. For acute exudative postoperative spread, in cases in which streptomycin has not been used prophylactically.
4. Intrapleurally, for pure tuberculous empyema without bronchopleural fistula.
5. In combination with open Schede thoracoplasty for tuberculous mixed empyema with bronchopleural fistula.
6. In infected chest wounds and sinuses.

JOHN J. MALONEY, M.D.

The Role of Streptomycin in the Surgery of Pulmonary Tuberculosis. PAUL T. CHAPMAN, E. J. O'BRIEN, PAUL V. O'ROURKE, and BRUCE DOUGLAS. *J. Thorac. Surg.*, 1949, 18: 15.

Patients receiving streptomycin were divided into the following groups:

Group 1. Those in whom the authors hoped that collapse or other surgical measures could be avoided or reduced in amount.

Group 2. Those in whom surgical procedures (contraindicated because of the patient's condition) could be made possible through streptomycin.

Group 3. Patients who received the drug as a prophylactic measure against spreads following surgical and collapse procedures or as a means of clearing these spreads if they occurred, and of making operation possible at an earlier time.

Group 4. Patients with proved or suspected tracheobronchial disease.

In Group 1, composed chiefly of patients with early, minimal, and moderately advanced disease, the authors have found that streptomycin has decreased the necessity of collapse measures by over 50 per cent. Even in more extensive disease, the results are sometimes so startling that further procedures are found unnecessary to complete the arrest of the disease.

In Group 2, the authors have found that the number of patients in whom surgical procedures (especially thoracoplasty) were possible was doubled by the administration of streptomycin. Many lesions seen before the administration of streptomycin were so extensive and of such character that collapse measures could not be performed. Also, the condition of many patients was too grave, and there were complications such as gastrointestinal, peritoneal, pelvic tuberculosis contraindicating surgical procedures. Streptomycin is markedly effectual in these complications, and after they have subsided and sufficient clearing of the lesion has taken place surgical procedures may frequently be completed with the expectancy of good results. The authors have often seen patients who were extremely ill, with high temperature and dyspnea (some almost moribund and in oxygen tents), in whom the temperature became normal rapidly, the oxygen tent was removed, and the patients continued to improve, making surgical procedures (with good results) possible later.

Group 3 somewhat overlaps Group 2, but is considered separately. This group includes patients in whom major procedures are contemplated, in whom soft lesions exist on the operation side, or an unstable lesion is present in the contralateral lung. Streptomycin is used here to prevent contralateral spread, and to clear or protect the contralateral lesions during and after surgery. In Negroes and others with known lack of resistance, the use of the drug is imperative. The authors are now operating on much softer lesions, earlier, and have observed fewer spreads since they have used streptomycin. They now believe that in all patients undergoing major surgical procedures it should be used prophylactically.

With regard to Group 4, there is no question as to the results obtained in proved ulceration. These lesions often heal as if by magic soon after the drug is started. The number of bronchoscopies performed for these lesions has been strikingly reduced. Prolonged treatment with silver nitrate is no longer necessary. Bronchoscopy is now done for diagnosis, and again after streptomycin therapy, the latter being virtually unnecessary, however, except for statistical purposes, because it is so rare not to find ulcers healed after streptomycin therapy.

As would be expected, the results were most striking in soft, mixed, and in the majority of recent lesions. However, occasionally in apparently old, fibrotic lesions excellent results have been obtained.

In almost all patients, some clearing of the lesions and clinical improvement have been noted. One of the great problems is to know what to do with these "old chronics" in whom the outlook seems hopeless. If we give streptomycin to them as a last resort, we shall probably tend to put the drug into disrepute.

In the authors' experience, the results of streptomycin therapy, in properly selected patients, have frequently been so amazing that there is an inclination to be overzealous in our attitude toward it.

JOHN J. MALONEY, M.D.

An Evaluation of Streptomycin as a Protective Agent in Pulmonary Resection for Tuberculosis. JULIAN A. MOORE, JAMES D. MURPHY, and PARKER D. ELROD. *J. Thorac. Surg.*, 1949, 18: 45.

The authors are of the opinion that streptomycin is a suppressive or bacteriostatic agent of proved value against the tubercle bacillus. It is not a cure for tuberculosis. In certain types of cases, however, it has proved to be of inestimable value in controlling the disease. They believe that it is too early for any one to attempt to assess its value in the treatment of tuberculosis, and that this cannot be done until several years have elapsed. From their clinical experience they consider that its chief place in the treatment of tuberculosis is as an adjunct to establish collapse procedures. With the use of streptomycin it has been possible for them to perform a lobectomy or a pneumonectomy for tuberculosis with a low morbidity and mortality rate and with excellent early results.

If the late results following pulmonary resection prove to be as gratifying as those after thoracoplasty, it is believed that indications for resection will be greatly extended. JOHN J. MALONEY, M.D.

Comparison of Results in 200 Consecutive Resections for Pulmonary Tuberculosis. CHARLES P. BAILEY, ROBERT P. GLOVER, and THOMAS J. E. O'NEILL. *J. Thorac. Surg.*, 1949, 18: 36.

From the authors' appraisal of their entire experience with pulmonary resection for tuberculosis, they have come to the conclusion that the beliefs first voiced upon the use of streptomycin in resection for pulmonary tuberculosis, by Glover, Clagett, and Hinshaw, are essentially corroborated. Provided that a previous course of streptomycin therapy has not rendered the patient bacteria streptomycin-fast, a definite suppression of the tuberculous process is produced during preoperative therapy. The patient's disease then temporarily assumes a more chronic course, so that it can be subjected to surgery with a much greater margin of safety. In the treated group, the incidence of tuberculous operative spreads and flare-ups become practically nil. Infections of the pleura and chest wall were remarkably reduced in spite of the inclusion of 14 cases of empyema (with proved bronchopleural fistula in 12 cases) in the streptomycin-treated group.

The complications which are essentially due to the resection rather than to the tuberculosis were unchanged. While more difficult cases were frequently chosen for surgery in the streptomycin-treated group, improvements in surgical technique rendered the nonspecific complications and mortality about the same.

The authors believe today that the mortality in pulmonary resection for tuberculosis can be set at any figure over 5 per cent (dependent upon the type of case selected for resection) and the choice between radical or conservative management must be left to the judgment of each individual clinic.

JOHN J. MALONEY, M.D.

Disposal of the Bronchial Stump in Lobectomy and Pneumonectomy for Bronchiectasis. ERIK UNONIUS. *Acta chir. scand.*, 1949, 97: 442.

As long as the tourniquet method was used, with or without separate ligature or suture of the vessels and bronchus, infection of the mediastinum and pleura, bronchial fistula, abscess around the stump, late hemorrhage, and sepsis were frequent sequelae. The technique of dissecting the hilus and disposing of the vessels and bronchi separately, however, did not itself ensure satisfactory results. The method of closing the bronchi is of great importance. The structures in the hilus of the part of the lung to be resected are anatomically dissected. After ligation of the vessels, the bronchus is divided and the outermost ring of cartilage is removed for the purpose of obtaining a soft invaginable stump. The edges are coapted with 3 or 4 interrupted silk sutures, avoiding the mucous membrane. The stump is closed with a continuous catgut suture. The corners are invaginated with silk, and the midpart of the bronchus with a few interrupted silk sutures. The wound in the mediastinum is powdered with a mixture of 30,000 units of penicillin and 5 gm. of sulfathiazole, and the stumps of bronchi and vessels are then buried separately into mediastinal tissue. A continuous pleural suture then closes the entire area.

Forty-nine of 53 patients so treated recovered. No case of insufficiency of the bronchial stump occurred, the stump in each case healing by first intention. SAMUEL KAHN, M.D.

On Abscess of the Lung. V.-M. ANTTONEN and HEINO LAITINEN. *Ann. med. int. fenn.*, 1948, 37: 183.

The present article is based on a study of 106 patients with lung abscess who were treated at Kivela Hospital, Helsinki, and in the Third Medical Department of the University of Helsinki. More than one-half of the patients were between 30 and 50 years of age, and 75 per cent of them were males. The primary diseases were pneumonia, primary atypical pneumonia, bronchiectasis, sepsis, and pulmonary tumor. In 94 per cent of cases the abscesses were single. It is pointed out that multiple abscesses may result from conditions such as bronchiectasis, as well as from bacterial embolism. In this series the symptoms were fever, cough, pain, purulent sputum, bloody sputum, loss of weight, and weakness. The causative agents were mostly penicillin-sensitive

aerobic cocci. It is suggested that a cavity with a fluid level represents a phase in lung abscess. It is sometimes intermittent, and frequent x-ray studies are necessary in some cases. Abscesses occurred more often in the right lung than in the left.

From a therapeutic standpoint, it is believed that medical care with combined sulfonamide-penicillin therapy is efficacious in a high percentage of cases of lung abscess. Treatment with these drugs can be followed safely for a longer period than the usually accepted 2 months.

The complications in this series were pleural empyema, exudative pleurisy, amyloidosis, and profuse lung hemorrhage. ROBERT E. FLORER, M.D.

Clinical Considerations in a Case of Tumor of the Upper Lobe of the Right Lung (Pancoast's Syndrome) with Secondary Infection, Diffusion of the Process to the Right Supraclavicular and Laterocervical Region, and Subsequent Fistulization (Considerazioni cliniche su di un caso di tumore del lobo superiore del polmone destro [sindrome di Pancoast] con infezione secondaria, diffusione del processo alla regione sopraclaveare e laterocervicale destra e successiva fistolizzazione). VINCENZO MIADONNA. *Minerva med.*, Tor., 1949, 40: 69.

This case of lung tumor was observed in a man of 40 years, in whom an adenocarcinoma originated in a bronchus and developed superficially in the right pulmonary apex, and thereby caused Pancoast's syndrome. The onset of the tumor was evidenced by a bronchopneumonic process in the pulmonary zone depending from the bronchus which was involved by the tumor. The process spread to the supraclavicular and laterocervical lymph nodes and soon invaded these two regions entirely. Simultaneously, infection of the tumor occurred, probably through some bronchus in which the secretions stagnated and offered a favorable medium for the development of the bacteria. The infection spread to the entire neoplastic mass, causing a phlegmon of the jugular region and the appearance of fistulas in the right supraclavicular area. The course of the disease was marked by intense pain which required the use of large doses of narcotics. Death occurred 16 months after the onset of the first symptoms.

It is recognized that pulmonary tumors can at times appear suddenly, as if they were common bronchopneumonic foci, but the present case was peculiar. In June, 1945 an opacity of bronchopneumonic type in the stage of resolution was observed in the subclavicular region, while in December the clinical and roentgen pictures differed in site and aspect: there was no trace of the previous opacity, but another more marked and completely different shadow had appeared in the apical zone. It is difficult to establish a pathogenetic connection between these two findings and the literature is silent on the subject, but a study of the case allows the following deductions:

The diagnosis of a bronchopneumonic focus was correct; the focus presented an irregular course and delayed resolution but eventually healed as examination 2 months later demonstrated the disappearance of the shadow and clinical signs. However, the patient continued to have his disturbances and his general condition did not improve; then another examination revealed the apical opacity with its peculiar aspect.

The bronchial secretion is carried upward by the action of cilia of the bronchial epithelium, but if at some point this epithelium is altered by the presence of a tumor, some stagnation of the secretion must result below the alteration even if the bronchial lumen is not decreased. This explains how the seat of the inflammatory focus may be totally different from that of the tumor, and also how the inflammatory focus may undergo resolution through the normal processes of immunization.

As the tumor developed superficially in the apical zone, it would seem difficult to establish its point of origin in a bronchus. But it must be remembered that a tumor sometimes does develop far from its bronchial origin and that the histologic aspect of the present tumor, an adenocarcinoma, demonstrates its origin from the elements of the bronchial glands.

RICHARD KEMEL, M.D.

Diagnosis of Carcinoma of Lung. LEWIS B. WOOLNER and JOHN R. MCDONALD. *J. Am. M. Ass.*, 1949, 139: 497.

An analysis of 200 cases in which a diagnosis of carcinoma was made on the basis of examination of smears of sputum or bronchial secretions was carried out. In 190 cases a final diagnosis of bronchogenic carcinoma or pulmonary metastatic carcinoma was made. In 4 cases a carcinoma in the esophagus, larynx, or trachea was demonstrated. In 4 cases the diagnosis was proved to be falsely positive. In the remaining 2 cases the final diagnosis was uncertain.

Exfoliated carcinoma cells in sputum or bronchial secretions provided the only preoperative microscopic evidence of cancer in 29 of 74 cases of bronchogenic carcinoma in which surgical exploration was carried out. In 13 cases of bronchogenic carcinoma in which the lesion proved removable, a preoperative diagnosis of cancer was based on the cytologic characteristics of the sputum or bronchial secretions. In 6 cases of Pancoast's tumor and in 4 cases of alveolar cell tumor there were carcinoma cells in the sputum.

Cytologic examination of sputum is of great diagnostic value in the case of patients suspected of having bronchogenic carcinoma and in whom bronchoscopic examination is contraindicated.

Carcinoma of the Lung with Intracranial Metastasis: Successful Removal of Metastatic and Primary Lesions. H. THOMAS BALLANTINE, JR., and FRANCIS X. BYRON. *Arch. Surg.*, 1948, 57: 849.

The authors have estimated that the incidence of intracranial metastasis from pulmonary carcinoma (based on data from several sources) is 23 per cent. The accepted theory with regard to the occurrence of metastases is based on the fact that the carcinoma

cells can enter the blood stream without passing through the capillary filter of the lung. The authors cite several reports of cases in which the patients lived from 2 months to 6½ years after removal of metastatic lesions. A case is presented in which both the metastatic lesion and the primary lesion were removed. The authors state that they were unable to find in the literature any report of such a case.

The patient was a 54 year old white man who complained of left-sided weakness, jacksonian epileptic attacks, and uncontrolled movements of the left foot. At operation, a subcortical cyst in the region of area 4 was removed, and radical extirpation of carcinomatous tissue in this area was done. Later a pneumonectomy was performed. Five months after the last operation there was residual spastic paresis of the left leg. There was no evidence of recurrence of either carcinoma.

The authors state that in dealing with these cases, frequently one must consider the brain lesion first because of the patient's intolerance to increased pressure from these expanding lesions. Care must be taken to localize the intracranial lesion as much as possible before surgery. Craniotomy is indicated in the presence of only two well localized intracranial lesions, whether or not the primary tumor can be removed. ROBERT E. FLORER, M.D.

Pulmonary Resection for Metastatic Malignancy. DOUGLAS ROBB. *Brit. J. Surg.*, 1948, 36: 200.

Prompted by Alexander and Haight's report in SURGERY, GYNECOLOGY AND OBSTETRICS (1947, 85: 129), of 24 collected cases (19 of their own and 5 collected) of resected pulmonary metastases in which 12 patients survived without recurrence for periods varying from 1 to 12 years, the author reports 3 cases of resection of metastatic hypernephroma to the lung.

In the first case a 42 year old woman had a left nephrectomy for hypernephroma of 4 years' duration. Eight years later a tumor developed in the left lower lobe for which left lobectomy was performed 6 years later. This patient has remained disease-free for 2½ years.

In the second case a 63 year old man had a right nephrectomy for hypernephroma, which was followed 6 years later by cough and blood-stained sputum. Left pneumonectomy disclosed metastatic hypernephroma in the lower lobe, with two small nodules in the anterior border of the upper lobe. After metastases became apparent in other sites, 11 months after pneumonectomy and at 14¼ months, the patient died with widespread multiple metastases involving the original site, the inferior vena cava, the diaphragm, and the right lung.

In the third case a 65 year old woman was not followed up after pneumonectomy. She was found to have an abdominal tumor 10 years before right nephrectomy was done; 10 years later symptoms of lung tumor developed. Left pneumonectomy disclosed metastatic hypernephroma at the hilum, with a small nodule near the edge of the lower lobe.

It is characteristic of hypernephroma metastases to appear after long intervals of apparent surgical cure of the primary lesion. Also, occasional cases of spontaneous regression of pulmonary metastases are reported (*Surg. Gyn. Obst.*, 1937, 65: 433).

Chest films at 3 to 6 month intervals up to 10 years after nephrectomy are recommended as an important feature of the follow-up of hypernephromas. FRANK B. QUEEN, M. D.

Experimental and Clinical Studies of the Role of Streptomycin in the Pleural Cavity. EDWARD J. BEATTIE, JR., BRIAN BLADES, and CHARLES HORTON. *J. Thorac. Surg.*, 1949, 18: 25.

Experiments and clinical studies were carried out to determine the pathologic effect and the absorption rate of streptomycin in the pleural cavity.

Operations were performed on 9 dogs. Three of these received 100 c.c. of saline into the pleural cavity, and biopsies were taken from the pleura 7 days later. Six of the dogs received 0.5 gm. of streptomycin in 100 c.c. of saline into the pleural cavities. Streptomycin assay studies were carried out on pleural fluid and venous blood. Biopsies of the pleura were performed 7 days after injection.

The absorption rate of streptomycin in the pleuras of dogs was rapid and the maximim blood levels were reached in 30 to 60 minutes.

There were no apparent differences in the microscopic picture of the pleura of animals receiving saline and of animals receiving streptomycin.

Twelve humans received streptomycin intrapleurally. These 12 cases can be subdivided into 6 cases of unscarred pleura, 2 cases of moderately scarred pleura, and 4 cases of markedly scarred pleura. The absorption curves were similar in all three types. The absorption is rapid; maximum absorption usually occurs in 30 minutes and falls to low levels in from 6 to 8 hours.

The following conclusions are drawn:

No harmful effects were seen either in the gross or the microscopic picture of pleura removed from dogs 7 days after the dogs received streptomycin in the pleural cavity.

The absorption of streptomycin from the pleura of dogs and human beings is rapid and high levels are reached.

Scarred pleuras were found to absorb streptomycin as well as unscarred pleuras.

JOHN J. MALONEY, M.D.

Streptomycin in Surgical Patients. EDWARD J. BEATTIE, JR., and BRIAN BLADES. *J. Am. M. Ass.*, 1949, 139: 902.

The value of streptomycin as an adjunct to the surgical treatment of pulmonary tuberculosis is shown. Since 1933 approximately 600 cases of resection for pulmonary tuberculosis have been reported; in these there was a 25 per cent mortality rate with 12 per cent empyemas and 8 per cent bronchopleural fistulas. Since the preoperative and postoperative use of streptomycin, there has been a re-

duction in the number of complications due to tubercular spread as well as a reduction in the immediate operative mortality. Not enough time has elapsed to determine whether the long range survival rate will be better in patients treated with streptomycin than in those undergoing resection for pulmonary tuberculosis prior to the use of streptomycin.

One gram of streptomycin in two divided doses appears to be the optimum amount. Streptomycin therapy should be started 7 days prior to, and continued for 14 days after, operation. This dosage almost completely obviates toxic effects. The pleural absorption of streptomycin is rapid and high levels are reached in 1 hour. Resistance of the tubercle bacillus to streptomycin develops soon, some evidence indicating that this can occur within 40 days.

With the added protection which streptomycin affords pulmonary resection for tuberculosis, it is technically possible to carry out major resection in desperate risk patients. In view of the fact that resistance of the tubercle bacillus to streptomycin develops, it is important that streptomycin be reserved for surgical treatment in any case which may be potentially surgical, and not be used in instances of minimal pulmonary tuberculosis.

C. Frederick Kittle, M.D.

HEART AND PERICARDIUM

An Experimental Study of Collateral Coronary Circulation Produced by Cardiopneumonopexy. B. Noland Carter, Edward A. Gall, and Charles L. Wadsworth. *Surgery*, 1949, 25: 489.

In view of the prevalence of coronary artery disease, several intensive studies have been directed within the last decade toward devising means of producing collateral coronary circulation. Several possible sources of such a collateral blood supply exist: the thoracic wall, including the pectoral muscles, the internal mammary artery, and the intercostal arteries; the pericardium; the omentum; and the lung. Investigators in this country and abroad have undertaken experimental studies utilizing various of these sources.

The results of the experiments described clearly indicate that vascular communications between the heart and the adherent lung can be produced by cardiopneumonopexy. They also show that the survival rate following ligation of the anterior descending branch of the left coronary artery is significantly improved following this operation and that the degree of myocardial damage is decreased. There are, however, several important physiologic questions which should be answered and which are concerned with the practical applicability of the procedure. These are chiefly three in number: (1) What is the direction of the blood flow and is it from the lung to the heart or vice versa? (2) How great a volume of blood can be delivered through the newly established channels and how long will such channels continue to function? (3) What is the degree of oxygenation of the blood supplied through the collateral vessels arising from the pulmonary circulation?

Gross and microscopic evidence has been obtained that by this operation new vascular channels can be produced between the myocardium and the adherent lung, but the amount of blood flow, the direction of the flow, and the duration of the patency of these channels has not been established.

In the instances in which cardiopneumonopexy was performed on normal hearts, injections of 10 per cent suspension of India ink in blood at normal pressures revealed some filling of the superficial vessels in the myocardium, but in the case of hearts rendered ischemic by coronary artery ligation there was considerably greater filling not only of the superficial vessels but of the deep ones as well.

Comparison of specimens obtained from dogs in which ligation of the anterior descending branch of the left coronary artery had been performed after cardiopneumonopexy with specimens from dogs in which ligation alone was done revealed less extensive infarcts and a lower mortality in the protected series. Therefore, the mortality in the protected series was 20 per cent, and in the animals with simple ligation it was 48 per cent. Severe infarction occurred in 75 per cent of the animals with simple ligation, but in only 23 per cent of the animals with ligation subsequent to cardiopneumonopexy.

John E. Kirkpatrick, M.D.

Experimental Anastomoses of Vessels to the Heart. Frank Gerbode, James Yee, and F. F. Rundle. *Surgery*, 1949, 25: 556.

Superior vena caval obstruction is frequently due to aneurysm or tumor, but in cases in which it is due to one of the various types of fibrosing mediastinitis it has been considered possible that the establishment of an alternative venous route to the heart will relieve the attendant symptoms of elevated venous pressure of the upper extremities and trunk, edema, and pleural effusion.

Using dogs, the authors have devised three operations for the relief of superior vena caval obstruction:

1. Approximately one week after placing a constricting ligature about the superior vena cava, above the level of the azygos vein, the azygos vein was anastomosed to the superior vena cava with the result that there was relief from the symptoms of vena caval obstruction. In a similar fashion, obstruction was produced at a level below the junction of the azygos, and relief was obtained by anastomosis of the azygos vein to the right auricle. It was hoped that the azygos would dilate somewhat to accommodate the physiologic load; however, this did not occur, and in several animals elevated pressures and angiograms indicated occlusion at the sites of anastomosis. Autopsy of these animals showed fibrosis and narrowing supposedly due to the muscularity of the auricular wall.

2. An atriocaval anastomosis was developed to create a shunt around the experimentally produced obstruction made below the level of the azygos. The

technique is sketched in the original article. There were no deaths following this procedure. Seven of the 10 animals having this shunt had a normal postoperative course, without exhibiting the usual signs of occlusion of the superior vena cava. Three animals developed late thromboses at the suture line, and in each instance some technical explanation could be furnished. Three of the animals have been followed up for more than a year and are known to have no arrhythmia detectable in the postoperative electrocardiograms. It is suggested that inasmuch as these anastomoses between the superior vena cava and the auricle are technically possible, such anastomoses might be applied to man under suitable circumstances. JANE C. MACMILLAN, M.D.

ESOPHAGUS AND MEDIASTINUM

Retained Food Remnants in Esophageal Diverticula Resembling Tumor and Dysphagia in Cases of Small Esophageal Diverticula at the Bifurcation Level. SVEN ROLAND KJELLBERG. *Acta radiol.*, Stockh., 1948, 30: 435.

The author stresses the similar roentgenological appearance produced by a polypoid neoplasm of the esophagus and a diverticulum of the esophagus when the latter is partially filled with food. He cites 2 illustrative case histories in females aged 45 and 66 years, respectively. They presented a history of intermittent dysphagia which was most pronounced during the ingestion of solid food. Barium swallow in both patients revealed a filling defect in the esophagus at the level of the tracheal bifurcation suggesting a polypoid tumor. Repeat examination 2 weeks later, however, visualized a large diverticulum at the same site. This presumably contained food remnants during the first study. The diagnosis of esophageal diverticulum was suspected because of the character of the dysphagia; it was intermittent, of long duration, and worse with solid food or large particles. C. FREDERICK KITTLE, M.D.

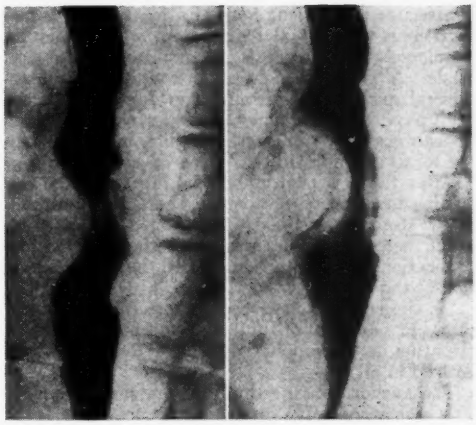


Fig. 1 (Kjellberg). On a level with the bifurcation a contrast defect can be seen in the esophagus resembling a tumor.

Tuberculous Esophageoepigastric Fistula (Fistola esofago-epigastrica tubercolare). VALENTINO DE FAZIO. *Riforma med.*, 1949, 63: 145.

An extremely rare esophageocutaneous fistula of tuberculous origin and with its external orifice in the epigastric region, is reported by the author.

The patient was a man aged 26 years. Five years prior to admission to the hospital he developed pain in the right hip which subsided after 7 months. Roentgenograms of the spine were negative. Two

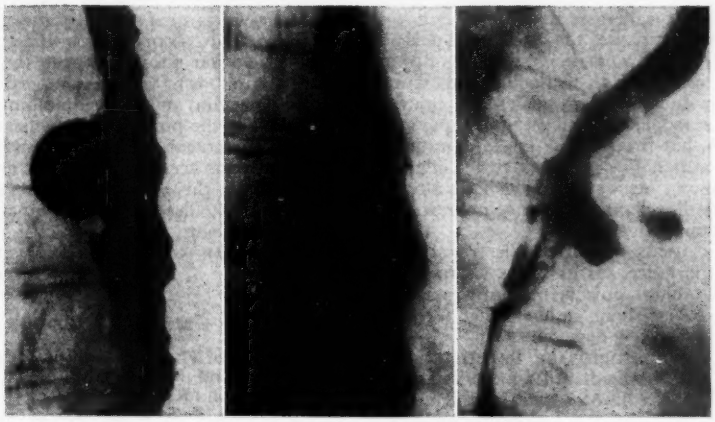


Fig. 2 (Kjellberg). A check examination one week later shows the diverticulum filled with contrast substance.

years later the patient noticed a hard, small tumefaction in the gluteal region from which a fistula developed. The diagnosis of sacroiliac arthritis was made. After a few months the condition subsided. Several months later severe pain developed in the right hypochondriac region and was followed by the appearance of a tumefaction, which in turn led to the formation of a fistula.

After the injection of lipiodol, an elongated sac leading toward the right costal arch and from there to the stomach was visualized.

Further x-ray studies established the existence of a connection between the fistula and the thoracic portion of the esophagus.

Six similar cases have been reported in the literature. The absence of subjective symptoms focusing attention on the esophagus, such as dysphagia, was noticed in all cases.

The author believes that tuberculous lymphadenitis was responsible for the condition, but a focus in the bones could not be excluded.

Drainage of the sac, followed by x-ray therapy, produced a cure. JOSEPH K. NARAT, M.D.

The Treatment of Mediastinitis from Perforation of the Esophagus. ARNE HOMB. *Acta chir. scand.*, 1948, 97: 189.

The esophagus in almost the whole of its course stands in close relation to various vital organs, and a perforation thereof may easily lead to serious complications. The most frequently encountered of these is infection of the mediastinum. It is especially the posterior part of the mediastinum that is of interest in case of perforation of the esophagus. It is bounded posteriorly by the spinal column and the prevertebral fascia and in front by the layer of fascia on the anterior side of the trachea. At the level of the bifurcation this latter fascia is connected with the bronchi, and here the downward diffusion of infections is to some degree prevented, a fact which is important with regard to treatment.

According to their cause, the esophageal perforations are divided into two main groups, one of which comprises the cases due to malignant tumors and the other, cases due to foreign bodies and injuries.

Cancer of the esophagus often leads to spontaneous perforation, but this usually develops gradually and does not so often give rise to extensive infection of the mediastinum. As it generally denotes a terminal stage of the disease, it is of minor interest from a therapeutic standpoint.

Perforations caused by foreign bodies are of greater practical importance. Most often, sharp bodies are present, but blunt objects may also perforate when they have been lying in the gullet for some time and decubital ulcers develop.

Three cases of mediastinitis due to perforation of the esophagus are described. All 3 patients had retained foreign bodies. Two of them had drunk lye when they were children and had since had symptoms of stricture. In one case the perforation occurred during an attempt to introduce a stomach tube; in the 2 other cases it occurred during exploration with an esophagoscope.

In the first case there developed a large, but circumscribed, mediastinal abscess. This was at first drained by means of cervical mediastinotomy, but as it later descended to the level of the ninth thoracic vertebra and the drainage became unsatisfactory, a posterior mediastinotomy had to be performed afterward. The patient had also empyema on the right side, which yielded to puncture treatment and injections of penicillin.

The second patient had a large perforation and developed diffuse mediastinitis, which was drained by a posterior mediastinotomy with a good result.

The third patient had a small lesion on the wall of the esophagus and a circumscribed mediastinal abscess developed; this was drained from the left side of the neck. However, drainage was not satisfactory. The abscess descended and the evacuation proceeded slowly. Perforation to a bronchus occurred on the right side with symptoms of a fistula between the esophagus, the abscess cavity, and the bronchial tree. The fistula closed later.

Penicillin-sulfonamide treatment did not prevent the development of a mediastinal abscess in the first case or check the progress of a phlegmon in the second; however, in these cases there were large perforations causing extensive infections. In cases of such large perforations infective matter will be constantly conveyed to the mediastinum from the esophagus, and it is not reasonable to expect that the penicillin and sulfonamides alone will be able to master the infection. Surgical intervention with drainage will, therefore, be necessary.

The author's experiences have also confirmed the view already mentioned, that infections in the mediastinum which are descending deeper than the level of the fourth thoracic vertebra cannot be satisfactorily drained through an incision in the neck, but must be treated by posterior mediastinotomy.

After giving a brief survey of the clinical features, prognosis, and treatment of mediastinitis occurring after perforation of the esophagus, the author reports 3 cases of his own, which were treated by sulfonamides, penicillin, and mediastinotomy with good results. While the prognosis in mediastinitis was formerly very unfavorable, the case histories published in recent years seem to show that an essential improvement in this respect has taken place since the use of sulfonamides and penicillin has been adopted in the treatment. Meanwhile, it is not likely that these remedies will render surgical intervention superfluous. JOHN E. KIRKPATRICK, M.D.

MISCELLANEOUS

Comparison of Thymic Hyperplasia in Myasthenia Gravis and Exophthalmic Goiter. ALLEN L. BRYAN, JOHN R. MCDONALD, and O. THERON CLAGETT. *Arch. Path.*, Chic., 1948, 46: 212.

The present article concerns 23 proved cases of myasthenia gravis, exclusive of thymoma, in which

thymectomy was done. In 4 patients extreme lymphoid hyperplasia, and in 2 patients, moderate lymphoid hyperplasia of the thymus were observed on microscopic examination. In the remainder, the glands either were normal or had been replaced by fat.

Twelve of the 17 normal glands in the myasthenia series showed areas of hyperplasia, but the percentage of glandular tissue was too low to permit their being considered hyperplastic, the average content of thymic parenchyma being only 29 per cent.

In none of the 20 cases of hyperthyroidism due to exophthalmic goiter did extreme hyperplasia of the thymus occur, and in only 1 case did moderate lymphoid hyperplasia occur.

Small areas of epithelial clustering occurred in 2 cases of the myasthenia series and in 3 cases of the hyperthyroid series, but the glands were essentially normal.

When the actual amount of glandular tissue in the thymus was determined and compared with Hammar's weights and with planimetrically determined percentages of thymic tissue in these glands, the weight of the parenchyma of 2 of 13 glands in the myasthenia series significantly exceeded the upper limit of normal, while the weight of the parenchyma of 7 of 9 glands in the hyperthyroid series exceeded the upper limit of normal.

There was apparently no correlation between the extent of hyperplasia determined microscopically and that which was observed when the actual weight of essential thymic elements exceeded significantly the expected upper limit of normal.

There was no correlation, on the basis of microscopic observations, between the extent of hyperplasia of one lymphoid organ and that of another in this study.

No correlation was found between the clinical and microscopic findings in myasthenia gravis, excluding the thymomas.

The term "thymoma" might be defined as a circumscribed tumor of the thymus composed of architecturally disarranged thymic elements, often with dense dividing trabeculae, and usually devoid of adult fat cells.

Thymoma. Hugh Reid and R. Marcus. *Brit. J. Surg.*, 1949, 36: 271.

The subject of thymic tumors in general is reviewed from a historical standpoint by the authors, including the pathologic classification and the relation to myasthenia gravis. Some of this information is summarized in tabular form.

The authors observed 5 patients who were considered to have tumors of thymic origin. Three of these had myasthenia gravis. In 2 the tumor was removed surgically by a sternum-splitting approach. One of these died. In 1 case the chest was explored by means of a transpleural approach but the tumor could not be removed. In another instance the tumor, apparently invading the anterior chest wall, was subjected to biopsy examination only. Two patients were treated by roentgen therapy, as was the inoperable tumor.

The tumors were classified as reticulum cell carcinomas in 3 instances. In one case there was no histologic diagnosis and in the other the tumor consisted of large masses of lymphoid tissue without Hassall's corpuscles or lymphoid follicles. Reticulum cells were prominent and often packed into groups.

The article is illustrated by photomicrographs and roentgenograms. Hiram T. Langston, M.D.

A Case of Thymolipoma. G. F. M. Hall. *Brit. J. Surg.*, 1949, 36: 321.

This report concerns the occurrence of a benign asymptomatic mediastinal tumor composed of fat and thymic tissue, and believed to be comparable to one other found in the literature.

The tumor was found at autopsy in a 47 year old man in good health, who died promptly after severe trauma. It measured 22 by 16 by 6 cm. and weighed 1100 gm.; it was pear-shaped in outline and was found arising from the anterior mediastinum but lying almost entirely within the right pleural cavity. On cut section the mass appeared to consist of a fatty matrix with small scattered areas of firmer consistency. Histologic sections showed the main bulk of the tumor to consist of normal-appearing adipose tissue. The other areas had the appearance of thymic tissue, most of which was compatible with normal thymic structure. One such area, however, was different from the rest in that it was better encapsulated and suggested an adenoma of the thymic reticulum cells.

The tumor was believed to justify the name of thymolipoma because it was argued that both the adipose and the thymic portions were concerned in the production of the tumor.

The possibility that many intrathoracic "lipomas" may have an origin similar to that of this tumor and that under such circumstances the thymic elements may merely be overlooked is discussed. The article contains gross and microscopic illustrations.

Hiram T. Langston, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Some Observations on the Functional Anatomy of Inguinal Hernia and Its Bearing on the Operative Treatment. DAVID H. PATEY. *Brit. J. Surg.*, 1949, 36: 264.

After operative exposure of both indirect and direct inguinal hernias, the author studied the functional anatomy of the surrounding structures by stimulating the conjoint internal oblique and transversalis muscles by faradic current. The following findings resulted:

1. Indirect inguinal hernia.

a. The pillars of the transversalis fascial sling constituting the medial margin of the internal ring are pulled laterally and upward as described by Lytle.

b. The arched fibers of the internal oblique constituting the lateral margin of the internal ring move medially.

These two structures thus form a shutter closing the ring by operating in different planes. This protection is further supported in a minor way by (1) contraction of the cremaster fibers branching up the cord and tending to plug the ring, and by (2) the pull of the attachment of the internal oblique to the inguinal ligament, elevating the latter and so protecting the ring from below.

2. Direct inguinal hernia.

a. The transversalis fascia becomes tightened through the pull on its attachment to the deep surface of the transversalis muscle.

b. By the contraction of the combined internal oblique and transversalis muscles immediately above the transversalis fascia, the upper limits of the direct inguinal hernia area are supported. The direction of movement is lateral, which tightens the medial tendinous part. This gives the effect of a hook rather than an arch. On contraction, there is a general movement of the whole structure laterally toward the muscular part, as well as the embracing and protective action of the internal ring of the muscular hook itself.

c. The inguinal ligament becomes tightened by the pull of the internal oblique attachment to it and also by the contraction of the external oblique, so that the lower edge of the direct inguinal hernia area is supported.

The main support is therefore the transversalis fascia.

These findings suggested the following procedures:

1. Indirect inguinal hernia.

The shutterlike action of the internal ring is reinforced by cutting a strip of fascia from the posterior lamella of the anterior rectus sheath and leaving its lateral edge attached. The strip is then brought through the internal oblique muscle immediately anterior to the medial edge of the ring. The strip is then passed through the upturned edge of the inguinal ligament and sutured, thus embracing the medial margin of the ring closely. This tightens with each contraction of the attached muscles and further helps to close the ring.

2. Direct inguinal hernia.

A continuous suture of fascia lata (Gallie) is used, being placed from below upward and laterally in an oblique direction, so that its loops get well tightened at each contraction and give maximal support to the underlying transversalis fascia. This is important since the shutterlike mechanism of the conjoint tendon, as postulated by Keith, does not exist, and the main protective agent for the direct inguinal area is a tightened transversalis fascia.

LEROY J. KLEINSASSER, M.D.

Benign Paroxysmal Peritonitis: Second Series. SHEPPARD SIEGAL. *Gastroenterology*, 1949, 12: 234.

The author reported his first series of cases of benign paroxysmal peritonitis in 1945, and an additional 6 cases are recorded in the present article. The disease is often confused with acute abdominal conditions requiring surgery; it is a disease of young people, is chronically disabling, and may last a lifetime. It may begin in childhood or, most often, in the second or third decade of life, and both sexes are affected. Recurrent paroxysms of abdominal pain and fever constitute the chief complaint. The attacks are usually of 2 or 3 days' duration, the hyperacute, febrile period lasting from 24 to 36 hours. The maximum temperature elevation varies from 100 to 105 degrees. Abdominal tenderness is invariable, and involuntary spasm of the abdominal wall is occasionally present. Constipation, vomiting, and leucocytosis are the rule. The pain is frequently localized in the right lower quadrant, thus simulating acute appendicitis. Chest pain of a pleuritic type is an occasional symptom. In most of the cases recorded in the literature the patients have been either Jewish or Armenian.

The etiology of the disease remains obscure; however, it apparently is closely related to the allergic disorders. Its onset in early life, its paroxysmal recurrence over many years without impairment of health, its basis in a reversible vascular reaction of hyperemia and edema are all consistent with this concept. Of 11 patients, 2 were atopic and 4 more had a definite family history of allergy; however, causative food allergens have not been demonstrated in any of 5 cases completely studied from this point of view. Eosinophilia has not been present in the author's patients during acute attacks, nor has adrenalin or the antihistamine drugs produced relief.

Three patients have been operated upon during an acute crisis. Hyperemia or edema of the peritoneum, with or without serous or serofibrinous exudate, comprise the operative findings. Interval explorations have been negative.

Treatment of the disease should include careful search for specific allergens and psychiatric evaluation. Surgical exploration is sometimes indicated if an intra-abdominal surgical lesion cannot be excluded. However, in 4 of 6 cases included in this report, appendectomy was done with no beneficial effect on the course of the patient's disease.

FREDERICK W. PRESTON, M.D.

GASTROINTESTINAL TRACT

Hematemesis. D. C. LEWIN and SIDNEY TRUELOVE. *Brit. M. J.*, 1949, 1: 383.

The present report covers 305 cases of hematemesis admitted to the Radcliffe Infirmary during the period from 1938 to 1947. The mortality was 19 per cent (58 deaths). A history of proved or probable chronic peptic ulcer was reported in 208 of the patients.

Age was the most important factor influencing prognosis, for the whole series as well as for the group with chronic peptic ulcer. The mortality rate rose steeply during the age period from 40 to 50 years.

In patients with chronic peptic ulcer, a long or short history of ulcer had little bearing on the immediate prognosis. This was true even in the older age group in whom one would normally expect to find a greater number of chronic ulcers.

The frequency of recurrent bleeding was about the same in old and young patients, and about the same proportion received massive blood transfusions.

The authors believe that general bodily changes occurring with advancing age are the principal causes for the higher mortality rate. The same is true of the other frequent complication of peptic ulcer—perforation.

Very few patients in this series were treated surgically; therefore, the authors have said nothing (as has been mentioned frequently in other articles) about the value of early decision and early surgery as a measure that tends to lower mortality in hematemesis in patients over 40 years of age.

FREDERICK C. HOEBEL, M.D.

Argentaffine Tumors of the Gastrointestinal Tract. Report of 11 Cases. CHARLES H. BROWN, ROGER P. BISSONNETTE, and HUGH H. STEELE. *Gastroenterology*, 1949, 12: 225.

Eleven cases of argentaffine tumors are reported. Eight of these occurred in the appendix and 3 occurred elsewhere in the gastrointestinal tract. Of the 8 patients in whom the tumor was located in the appendix, 5 were operated upon for acute appendicitis. In several of these cases the tumor probably acted as a fecalith producing occlusion of the lumen and subsequent edema and inflammation. Three patients had no symptom of appendicitis, the appendix having been removed as a routine procedure during other abdominal operations. In none of these cases was metastases, mitotic figures, or invasion of the muscularis found. Patients were followed for an average of 5½ years without evidence of recurrence. Although there are several reported cases of malignant argentaffine tumors of the appendix, those in the present series are benign. It is possible that argentaffine tumors of the appendix cause symptoms of appendicitis and are removed before they have a chance to become malignant.

Of the 3 tumors which occurred in the intestinal tract elsewhere than the appendix, one involved the cecum and two, the ileum. All 3 lesions were malignant and had metastatic glands. These patients were operated upon and the lesions resected. Two patients died within 16 months of surgery, and 1 was alive 8 years after surgery.

Argentaffine tumors arise from Kultschitsky cells which are found in all parts of the gastrointestinal tract and are most numerous in the crypts of Lieberkuhn in the terminal ileum and appendix. They constitute about 8 per cent of all observed neoplasms of the small intestine. They most frequently occur in the terminal ileum and appendix, but may occur anywhere in the gastrointestinal tract. Occasionally they are multiple.

The incidence of malignancy of argentaffinomas occurring outside the appendix varies from 22 to 38.3 per cent in different reported series. The authors conclude that since some become malignant, all must be treated as such. FREDERICK W. PRESTON, M.D.

Lymphosarcoma of the Gastrointestinal Tract, with a Report of 21 Cases. M. A. SPELLBERG and SIMON ZIVIN. *Arch. Int. M.*, 1949, 83: 135.

The authors, in a review of their own material, found 1 case of lymphosarcoma to every 88 cases of gastric carcinoma in patients ranging from 26 to 57 years of age, and of an average age of 47 years. Emphasis is made that when a neoplasm is found in a younger patient, it is more likely to be a lymphosarcoma than a carcinoma.

By and large, the symptoms found with lymphosarcoma of the stomach tend to be nonspecific and somewhat ulcerlike, consisting of postprandial distress, belching, bloating, pain unrelieved by food, backache, and vomiting; weight loss was noted in 5 of 11 patients. Hematemesis or melena was noted in 6 of the 11 cases, and occult blood in the stool 7 times; frequently there was an associated anemia. It is believed that this bleeding feature has not been emphasized in the literature previously. In 5 cases an epigastric mass was palpable.

Roentgenography is of help diagnostically only infrequently. The usual diagnosis made is that of carcinoma; occasionally, the roentgen diagnosis is normal stomach or large rugal folds.

Gastroscopy is helpful but not infallible in cases of diffuse infiltration. The diagnostic difficulties are attributable to the morphology of the tumor, inasmuch as it so frequently produces a diffuse type of infiltration without the formation of localized defects.

Pathologically, the lesion is usually encountered on the greater curvature of the stomach. Involve-

ment of the perigastric lymph nodes was found in 8 of 11 cases, but no liver metastases were noted. Five of the lesions were the small cell type of malignant lymphoma, and 5 were the large cell or reticulum cell type. The prognosis was associated with the cell type of the lesion; the patients with the small cell type had an average survival of 44 months, whereas the 5 patients with the large celled, reticulum type had an average survival of only 7 months.

The opinion that there is a relatively favorable response to treatment of lymphosarcoma is not shared by all observers. In the literature the survival figures given vary from 6.6 months to 7 years. The authors state that their survival figures for lymphosarcoma are better than those for carcinoma of the stomach. They had a total of 3 "5 year cures" of lymphosarcoma.

Ten cases of localized intestinal lymphosarcoma were observed, 5 in the small intestine and 5 in the large intestine, giving an equal incidence in the small and large bowels for the series; although references can be found in the literature concerning the increased incidence of lymphosarcoma in the small intestine. About 1 lymphosarcoma was found to every 300 carcinomas in the large bowel and 1 lymphosarcoma was found to every 4.1 carcinomas in the small bowel.

The symptomatology of lymphosarcoma of the bowel varies with the location of the tumor, but it is stressed that an abdominal mass was palpated in 80 per cent of the cases; varying signs of obstruction were present but no blood in the stools was noted. No specific diagnosis was ever possible by means of roentgenography in these cases. As with gastric lymphosarcoma, there was absence of widespread metastases; however, intestinal lymphosarcoma appears to carry an extremely poor prognosis, as most of the patients died in less than 6 months.

JANE C. MACMILLAN, M.D.

The Vascularization of the Human Stomach. A Preliminary Note on the Shunting Effect of Trauma. A. E. BARCLAY and F. H. BENTLEY. *Gastroenterology*, 1949, 12: 177.

Using a technique of microarteriography described by Barclay in 1947, the authors studied the arterial circulation of the stomach wall in cadavers and in specimens of stomach resected for duodenal ulcer. In order to demonstrate the arteries and their branches down to the arterioles, a preparation of bismuth oxychloride was injected into one of the gastric or gastroepiploic arteries. The size of the particles in the preparation used was such that the capillaries were not outlined. In the submucous layer there is a plexus of arterioles so profuse that an injection through a single gastric or gastroepiploic artery suffices to fill the whole vascular plexus of both anterior and posterior gastric walls, and also the other gastric and gastroepiploic arteries by retrograde flow. To demonstrate small arterioles and capillaries a 10 per cent solution of colloidal silver iodide was used. By use of this material a second plexus of smaller vessels close to the mucous membrane can be demonstrated. The capillaries which vascularize the mucous membrane arise from this plexus.

There was a striking difference between the microarteriographs obtained from cadaver specimens and in the resected specimens. In the former there was much more complete filling of the vessels of the mucosa. One stomach was obtained from a patient under high spinal anesthesia, and in this specimen the vessels of the mucosa also filled completely when microarteriography was done.

The authors conclude that arteriovenous anastomoses exist in the wall of the stomach in the region of the submucous plexus of vessels. The trauma incident to gastric resection causes these anastomoses to shunt blood away from the mucosa. However, the shunt mechanism is under the control of the sympathetic nervous system and when the sympathetic nerve pathways to the stomach are blocked the shunt remains closed.

Arteriovenous shunts similar to these demonstrated in the gastric wall have been demonstrated by Trueta in the kidney.

FREDERICK W. PRESTON, M.D.

Acute Perforations of the Stomach, and Small Bowel Ulcerations. CARLYLE AUGUST LUER. *Surgery*, 1949, 25: 404.

Between 1938 and 1948, 362 cases of acute, free perforations of gastrointestinal ulceration were seen at the St. Louis City Hospital. A detailed examination of their records forms the basis of this study. Many interesting points follow closely similar studies previously reported. Some statements of fact are particularly worthy of attention.

The operative mortality has gradually dropped from 1938 to 1948 and is possibly attributable to the use of sulfonamides and penicillin. However, it is particularly worthy of attention that the mortality climbed rapidly with the number of hours perforation was present before admission, thereby delaying surgical treatment.

From 0 to 6 hours the mortality was 10.6 per cent; from 6 to 12 hours, 25.4 per cent; from 12 to 24 hours, 52.0 per cent; and over 24 hours, 75.9 per cent. Thus the wisdom of early and good surgical management seems unchanged by the use of sulfonamides and antibiotics.

It is of interest that in 22 of the patients, perforation occurred while the patient was in the hospital, and all patients died. This is not an occurrence that is common only to this hospital, and the importance of careful and early evaluation of patients in the hospital who present acute abdominal symptoms is stressed.

The physical findings of a systolic blood pressure of 80 or lower, a low white count, subnormal temperature, and rapid respirations were ominous, followed by a high mortality.

Certain findings are important because of the high incidence of their occurrence in acute perforation. Pneumoperitoneum was demonstrated by roentgen-

ogram in 63.5 per cent of cases in less than 6 hours and in 89.7 per cent in over 6 hours.

"Boardlike" involuntary rigidity was present in 98.6 per cent of cases within 6 hours but was not so constant after the initial chemical peritonitis had subsided. Auscultation was done in two-thirds of the cases. Bowel sounds were absent in 79.2 per cent of patients and hypoactivity was observed in 13.8 per cent.

The conditions existing which were mistaken for acute perforations were, in order of incidence, appendicitis, acute cholecystitis, and acute pancreatitis. However, blood diastase levels were obtained in about two-thirds of the cases of acute perforation and were normal in 97.5 per cent; the remainder were elevated between 600 and 800 units.

The author concludes that the duration of time from perforation to operation seemed to be the most important factor in influencing the prognosis. As time elapsed, increased soilage of the peritoneal cavity and bacterial infection occurred, and dehydration and electrolyte imbalance increased. Therefore, the most effective treatment consisted of correction or prevention of electrolyte imbalance, followed by surgery as soon as possible for closure of the perforation with an omental graft and closure of the incision without drainage.

FREDERICK C. HOEBEL, M.D.

Diverticula of the Stomach. A Report of 30 Cases and a Review of the Literature. CHARLES H. BROWN, ROGER P. BISSONNETTE, and ROBERT D. ALBEE. *Gastroenterology*, 1949, 12: 10.

Studies were made of 30 cases of gastric diverticula. By far the most common location for gastric diverticula is in the cardia, and these are usually congenital in origin. Diverticula located outside of the cardia are frequently associated with other pathological lesions such as carcinoma, ulcer, aberrant pancreatic tissue, gall-bladder or pancreatic disease. There are no characteristic symptoms of the condition, and if symptoms are present they are usually caused by other conditions. In 7 of the 30 cases studied, the symptoms were thought to be due to the diverticula itself and consisted of ulcerlike distress. Gastric hemorrhages resulting from the diverticulum occurred in 2 cases. Conservative therapy utilizing an ulcer régime usually is sufficient to control the symptoms. Surgery was not necessary in any of the 30 reported cases. In cases coming to surgery (recorded in the literature), it is often very difficult to find the diverticulum. F. J. LESEMANN, JR., M.D.

Surgical Treatment of Peptic Ulcer in the Region of the Cardia (Zur chirurgischen Behandlung des cardianahen Ulcus ventriculi). H. FINSTERER. *J. internat. chir.*, Brux., 1949, 9: 1.

On the basis of an exceptionally wide experience in gastric surgery, the author, director of the surgical department of the University Hospital at Vienna, Austria, discusses the problems of peptic ulcer in the region of the cardia.

Ulcers near the cardia are not as rare as is generally assumed; among a series of 8,230 gastric resections for ulcer, the author observed 614 cases, i.e., about 20 per cent. This high percentage is partly explained by the difficulty of diagnosis and treatment. A number of interesting cases are described in which the ulcer was either mistaken for carcinoma or declared inoperable by other men, and in which surgery by the author resulted in complete cure.

Errors in diagnosis are frequent because the symptoms and signs are less characteristic than in pyloric ulcers. Frequently hypoacidity or anacidity are present rather than hyperacidity, and roentgen examination reveals less typical pictures. The ulcer is often mistaken for carcinoma, cardiospasm, or angina pectoris. Even at laparotomy, correct diagnosis is difficult when the ulcer is situated at the posterior wall, as it often penetrates into the lesser omentum or in the pancreas. Therefore, the author recommends in all cases in which an ulcer is diagnosed clinically but not found at operation, that a gastrotomy be made and the inside of the stomach explored with the bare finger, without rubber gloves. In this manner the ulcer is discovered easily, and no infection after digital exploration has ever occurred in the author's experience.

Resection of ulcers at the posterior wall should be done only if the ulcer is at least 1 to 2 cm. distant from the esophagus because sutures involving the esophageal wall are unsafe.

The author discusses in great detail the indications for, and techniques of, various operations. He rejects gastroenterostomy as valueless. The best results were achieved by pylorogastrectomy. In patients under 60 years with ulcers near the cardia, penetrating to the lesser omentum, the author performs the Billroth I operation with excellent results; he had no fatality in 109 patients treated by this method.

If an ulcer of the posterior wall involves the cardia, it is left in place and resection of the distal half of the stomach and the pylorus is performed after the method of Kelling-Madlener. If the length of the duodenum permits, a BillrothI operation or an anastomosis by the Hofmeister-Finsterer method is done.

This abstract can only give a perfunctory picture of this very interesting article which should be read in the original. WERNER M. SOLMITZ, M.D.

Production of Gastric and Duodenal Ulcers by the Prolonged Administration of Mecholyl. J. WENER, H. E. HOFF, and M. A. SIMON. *Gastroenterology*, 1948, 11: 904.

Mecholyl (acetyl-β-methylcholine) is a choline ester which evokes an increased, more acid gastric secretion in dogs. When injected intramuscularly, in a beeswax and mineral oil mixture, it prolongs and increases continuous gastric secretion.

The observation that single injections of mecholyl in dogs produced a bloody diarrhea and postmortem findings of hemorrhages and erosions of the gastric

and duodenal mucosa, led the authors to investigate the effects of the drug. The effects of repeated injections of mecholyl were studied in two groups of dogs. In the first group, 29 dogs received daily injections of an aqueous solution of mecholyl subcutaneously. The dosage levels (determined by experience) were the maximum each dog could tolerate without collapsing or going into shock. Injections were made daily at 9 a.m., and the animals were not fed or given water until 4 p.m. The diet consisted of ground red beef and all animals were allowed free access to water after 4 p.m. Seven of the dogs were also given prostigmine along with mecholyl. All but one of the dogs died from the general effects of the drug.

In the second group of animals (19 dogs), the mecholyl was embedded in a beeswax and mineral oil mixture in order to prolong the effects of the drug. The drug was prepared according to the method devised by Code and Varco to prolong the action of histamine; it contained approximately 90 to 100 mgm. of mecholyl per cubic centimeter. "Subshock" dosage levels were determined. The diet and feeding times were the same as for the first group. All but 4 of the dogs died from the general toxic effects of the drug, and the remaining dogs were sacrificed.

The experimental data are tabulated. Following the injections of mecholyl a sequence of pathological changes occurred which consisted of marked hyperemia and engorgement of vessels, interstitial mucosal hemorrhages with superficial necrosis, erosions, and acute or subacute ulcerations in the stomach and duodenum.

In nearly all instances, marked generalized parasympathetic responses accompanied every injection of mecholyl, and led to immediate collapse and death of the first few dogs, especially when prostigmine was injected together with the drug. This state of collapse was immediately relieved by the subcutaneous injection of atropine.

Mecholyl caused vomiting, frequently blood tinged, and occasionally massive hematemesis. It also caused increased gastrointestinal motility which, within 15 minutes, resulted in bloody diarrhea. This condition usually terminated in from 1 to 2 hours, and within 8 to 24 hours stools were formed, but tarry in color. In numerous instances gastrointestinal bleeding continued for 12 to 18 hours after injection, and finally such animals died as a result of extensive hemorrhages from the gastrointestinal tract.

Postmortem examination of the stomach usually revealed diffuse hyperemia, multiple mucosal hemorrhages, and areas of superficial necrosis and erosion. The hyperemic discoloration of the stomach was most severe in the fundic area, which was sharply demarcated from the paler, pyloric region. Beginning sharply at the most proximal end of the duodenum, the hemorrhagic involvement of the mucosa extended through the entire intestine with decreasing severity as the ileum was approached. Changes at autopsy were most pronounced when death ensued shortly after an injection with mecholyl.

Histological examinations of the hemorrhagic areas of the stomach and duodenum showed marked dilation of the blood vessels, especially the capillaries, and the presence of acute diffuse interstitial hemorrhage into the mucous membrane, with necrosis of the most superficial layers of the mucosa. In a number of situations underlying a relatively intact mucous membrane in which interstitial hemorrhage had occurred, infiltration by acute inflammatory cells suggested a focal hemorrhagic gastritis or duodenitis.

The erosions were multiple, were usually confined to the fundic portion of the stomach, and were less often seen in the pylorus and duodenum. Most of the lesions were erosions, but a few dogs showed gastric or duodenal ulcers. Involvement of the deeper layers of the intestinal wall and the presence of an inflammatory ridge about the lesion were the criteria for ulcer.

Experimental data following the prolonged administration of mecholyl in beeswax are tabulated. The pathological changes in the stomach and duodenum were pronounced and lasted longer than in the dogs receiving mecholyl in an aqueous solution. No ulcers were found in the stomach or duodenum, although gastric or duodenal erosions were found in 8 of the 19 dogs injected.

Although the quantities of mecholyl injected with the beeswax were from 2 to 4 times greater than that given by subcutaneous injection of mecholyl in aqueous solution, the general parasympathetic responses to the drug were not as severe, and fewer dogs collapsed or died immediately after the injections than when aqueous mecholyl was given alone. Bloody diarrhea persisted much longer and led to the death of 7 of 19 dogs from severe gastrointestinal hemorrhages. The hemorrhagic appearance of the gastrointestinal mucosa was more extensive and more severe than in the first group of dogs given mecholyl alone.

The microscopic findings in the numerous sections taken from the gastrointestinal tract strongly suggest that vasodilatory action of mecholyl on blood vessels was the main factor in the pathogenesis of these lesions. It appears that the marked vascular engorgement and hyperemia gave rise to stasis, increased capillary permeability and tissue anoxia, which resulted in extravasations of red blood cells into the mucosa, and was followed by superficial necrosis of the mucous membrane erosions and eventually led to the formation of true ulcers. Additional factors, such as trauma, acidity, and malnutrition probably play a part in the genesis of the lesions observed in these experiments.

ERNEST D. BLOOMENTHAL, M.D.

Total Gastrectomy (Gastrectomia total). VOLTA BAPTISTA FRANCO. *Rev. brasil. gastroenter.*, 1949, 1: 7.

Three total gastrectomies for cancer of the stomach were performed by the author.

The first patient succumbed to the operative shock; the second patient died on the eighth postoperative day from peritonitis caused by a dehiscence of the suture line connecting the esophagus with the jejunum. The last person operated upon is still alive, 18 months after operation. This patient was in excellent condition for a period of 15 months following the removal of his stomach; then he began to experience difficulty in swallowing food. Roentgenograms showed a tumor in the distal portion of the esophagus. The patient's condition necessitated performance of a jejunostomy. Preoperative measures have been taken for transthoracic esophagectomy.

JOSEPH K. NARAT, M.D.

Malfunction of the Gastrojejunal Anastomosis during the Early Postoperative Period Following Gastrectomy (Les dysfonctionnements précoces de l'anastomose après gastrectomie). LUCIEN LEGER and JEAN LOYGUE. *J. chir.*, Par., 1949, 65: 116.

This discussion is limited to the factors which prevent a good result from jejunostomy in the early postoperative course following the Pean type of gastric resection. These factors are classified under four headings: (1) inflammatory obstruction, (2) mechanical difficulty, (3) functional disturbances, and (4) nutritional difficulties.

A case is reported in which evidence of obstruction of the efferent loop became apparent on the fifth postoperative day following a gastric resection. Reoperation revealed a fibrinous type of peritonitis, and dense adhesions posterior to the mesocolon had blocked the anastomosis. There was no leakage at the suture line or other apparent cause for the peritonitis. The authors cite several cases of other surgeons in which failure of the anastomosis to function was attributable to inflammatory adhesions.

Among the most frequent causes of mechanical obstruction is retrograde invagination of the jejunum into the stomach. Other causes include incarceration of a loop of small intestine in the opening in the mesocolon, obstruction of the anastomosis by a mucus plug, and kinking of the efferent loop by a short mesocolon.

Certain cases of gastric dilatation following gastric resection appear to be on a functional basis. The authors postulate a reflex mechanism of which the splanchnic nerves constitute the motor inhibitory pathway. Splanchnic block often will relieve the condition and permit normal function to become established.

Resection of the pylorus in itself has the effect of reducing gastric peristalsis, which may be a contributing factor to postoperative gastric atony in some cases.

Reflux of the gastric contents along the proximal loop of the jejunum with subsequent dilatation of the duodenum and the stomach was encountered in 2 cases described by the author.

The longitudinal incision in the jejunum may interrupt peristalsis along this segment of bowel and thus prevent function of the anastomosis.

Edema at the anastomotic stoma on the basis of hypoproteinemia is another condition which may interfere with the proper evacuation of the stomach. However, the authors do not attribute much importance to this factor because hypoproteinemia cannot be demonstrated in many patients with postoperative retention. FREDERICK W. PRESTON, M.D.

Intestinal Obstruction. Indications For Surgical Treatment. (Oclusion intestinal. Indicaciones del tratamiento quirurgico). RAMÓN FLORES LÓPEZ and ANTONIO LUNA OLIVARES. *Rev. gastroenter. Mexico*, 1949, 14: 1.

Wangensteen's classification of intestinal obstruction is preferred by the authors to that of Ochsner, Cokkinis, and others.

Among other diagnostic measures the authors use peritoneal puncture. From the viewpoint of indication for surgical treatment, all patients with intestinal obstruction may be divided into 4 groups:

1. Patients who require immediate surgical intervention because of a strangulated external or internal hernia, mesenteric thrombosis or embolus, volvulus, acute intussusception, strangulation caused by intestinal atresia, imperforate anus, or congenital diaphragmatic hernia.

2. Patients in whom the operation may be postponed from 18 to 24 hours to allow improvement in the general condition and the institution of decompression of the intestines. To this group belong certain patients with strangulation of the colon, obstruction caused by adhesions, or acute episodes of chronic intestinal intussusception.

3. Patients in whom the operation may be postponed for several days while decompression is being employed. To this group belong patients with an obstruction of the gut by a stone or intestinal parasites, or with ileus caused by compression of the gut (by adhesions or bridges), peritoneal abscess, or by perivisceritis.

4. Patients with functional ileus, either spastic or paralytic. This group does not require any surgical intervention.

As a rule, the authors prefer spinal anesthesia, particularly the fractional method. For patients in a poor general condition and with marked hypotension, general anesthesia with a closed circuit is employed. If spinal anesthesia is used, it is important to administer oxygen through a nasal catheter. If the Levin tube is not inserted before the operation, gastric lavage is indicated preoperatively, to prevent aspiration of the gastric contents into the respiratory tract.

If an external strangulated hernia is present, the incision is made over it. In other cases the x-ray findings may furnish information as to the desirable site of incision. If the location of the lesion cannot be established before the operation, a right lower paramedian incision is made. If the obstruction is located in the lower portion of the small intestine, a right paramedian incision is made, one-third of it being located above, and two-thirds of it below, the

umbilicus. If the obstruction is in the upper portion of the small intestine, a left paramedian incision is made, with two-thirds of it above, and one-third below, the umbilicus.

A subcostal incision is employed for the treatment of a diaphragmatic hernia, the abdominal approach being used exclusively. Paramedian incisions are used for the treatment of obstructions of the large intestines.

The authors do not recommend transverse incisions because they are more time-consuming and cause more bleeding. Longitudinal incisions are exposed to lesser tension, produce less postoperative pain, and are more reliable as far as prevention of postoperative disruption of the abdominal wall is concerned.

The authors prefer a side-to-side anastomosis to a terminolateral or end-to-end anastomosis.

Patients with volvulus of the intestines or a mesenteric infarct require a relatively large amount of blood for transfusion.

The Mikulicz method is employed only in selected cases of ileus of the large intestines, such as volvulus of the sigmoid or of the cecum, with gangrene, or carcinoma of the colon with perforation or irreducible intussusception.

If multiple strictures of the small intestines, caused by tuberculosis, mycotic processes, or nonspecific granuloma, are encountered, or if an extensive cancer or numerous postoperative adhesions are found, a short circuit is established by means of an intestinal anastomosis.

Enterostomy is done only in patients with carcinomatosis or tuberculosis, if the general condition is grave. The procedure is useless in paralytic ileus.

Colostomy is employed in patients with ileus of the large intestines caused by cancer, diverticulitis, granuloma, or constricting pericolitis.

Sulfanilamide in saline solution is used intraperitoneally before closure of the abdominal wall. Penicillin and streptomycin are given parenterally.

The authors stress the value of the Wangensteen tube for the treatment of selected cases of intestinal obstruction. JOSEPH K. NARAT, M.D.

Primary Malignant Disease of the Small Bowel. DAVID STANLEY LIKELY, JAMES R. LISA, MELVIN H. STITCH, and H. D. STEIN. *Arch. Int. M.*, 1948, 82: 206.

The authors give an excellent review of the literature concerning malignancies of the small bowel. In addition, they present 17 cases recently encountered, from which they draw the following conclusions:

Carcinoma of the small bowel comprises about 3 per cent of the gastrointestinal carcinomas and is much less common than carcinoma of the large bowel. Not including this series, there have been reported only about 365 cases of carcinoid, or argentaffinoma tumors, of the small intestine. Lymphosarcoma, in contrast to carcinoma, is observed more commonly in the small than in the large bowel according to the literature. There are about 149 reported cases of lymphosarcoma of the small intestine including those of the authors.

The prognosis is considered poor in carcinoma and lymphosarcoma, and good in carcinoid.

Clinically, one of these rare tumors may be suspected in the presence of mild unexplained nausea, intermittent obstruction, and mild anemia.

JANE C. MACMILLAN, M.D.

The Surgical Therapy of Duodenal Ulcer. JOHN H. GARLOCK and ALBERT S. LYONS. *Surgery*, 1949, 25: 352.

The authors present a review of 187 cases of duodenal ulcer. All patients were subjected to partial gastrectomy in the private practice of the senior author. The usual indications for surgery formed the basis for selection of patients. These were: failure of a medical régimen to control the disease, repeated hemorrhages, perforations, and obstruction due to scarring. The authors are of the opinion that the only indication for gastroenterostomy in duodenal ulcer is the presence of a benign obstruction accompanied by a low acidity in an elderly patient.

Usually, two-thirds of the stomach are removed. It is emphasized that the greatest care must be taken to completely remove the pyloric antrum and pyloric ring and, in the vast majority of cases, this means that the ulcer-bearing portion of the duodenum must be removed. It is the authors' belief that with careful, meticulous dissection this can be accomplished in almost 100 per cent of the cases, and in this series only one exclusion operation of the Finsterer type was performed. This patient developed a gastrojejunocolic fistula 6 years later. If the surgeon is positive that he can remove the pyloric ring, and if the ulcer is located at the bed of the first portion of the duodenum or in the second portion, then there is no harm in leaving the ulcer behind provided a good closure of the stump can be made. The author favors a Hofmeister retrocolic type of anastomosis. If extensive retroperitoneal dissection has been done in the region of the duodenum or pancreas a drain is always inserted.

The author believes that vagotomy should be performed as well as a partial gastrectomy in those cases in which there is a marked hyperacidity or recurrent hemorrhages. Vagotomy alone is of value in gastrojejunal ulcers following adequate partial gastrectomy.

There were 4 deaths in this series of 137 patients, an operative mortality of 2.1 per cent. There have been only 4 cases of recurrent ulceration; in 3 of these an adequate partial gastrectomy had been performed, and in the fourth case an exclusion operation had been done. F. J. LESEMANN, JR., M.D.

Necrotic Jejunitis. K. A. FICK and A. P. WOLKEN. *Lancet*, Lond., 1949, 1: 519.

The clinical features, diagnosis, treatment, and pathology of an endemic necrotic jejunitis are described. Two cases among 18 under observation are described in detail.

Necrotic jejunitis is believed to be initiated by defects in the diet. The 18 cases occurred in 13 men and 5 women. Their average age was 61 years. Sixteen died with an average duration of 7 days of illness. Two patients in whom a wide resection of the jejunum was carried out lived.

Recent work suggests that the Clostridium "enterotoxicus," or Clostridium welchii, type F, plays an important part in the causation of jejunitis. RICHARD J. BENNETT, JR., M.D.

Volvulus of the Cecum. EDUARD MELCHOIR. *Surgery*, 1949, 25: 251.

Of 6 patients with volvulus of the cecum, 5 were treated by primary resection of the twisted bowel. All of these recovered, although in one patient the condition was complicated by gangrene and peritonitis. In a still more severe case the patient did not sustain the nonradical intervention. On the whole these results are better than those generally obtained in distortion, with or without cecostomy and/or cecopexy. Nonradical operations expose the patient to the danger of recurrence. Primary resection is, therefore, the preferred treatment in this emergency. The possible use of emetine as a supplement following operation should be considered.

CHARLES BARON, M.D.

Volvulus of the Cecum, with a Review of 100 Cases in the Literature and a Report of 6 New Cases. J. L. DONHAUSER and S. ATWELL. *Arch. Surg.*, 1949, 58: 129.

The previous literature reviewed by the authors revealed many pertinent facts. The incidence of volvulus of the cecum is about 1 per cent of the cases of intestinal obstruction in this country, but it is higher in Central Europe and in Russia.

Torsion or volvulus of the cecum has been defined as a condition in which there is torsion limited to the cecum, ascending colon, and adjacent portion of the small intestine. Hyperfixation of the hepatic flexure, ascending colon, or terminal end of the ileum, and hyperdescent of the cecum are contributing factors to torsion of the cecum, but the essential anomaly is hypofixation of the cecum. Torsion, when it occurs, is commonly from 180 to 360 degrees, but it may be as much as 720 degrees.

Dietary measures are probably contributory and are thought to explain the high incidence in Central Europe and Russia. The incidence is higher in those who have had previous peritoneal damage.

Roentgenologic interpretation is difficult except that it confirms an intestinal obstruction. A barium enema is of value when the column of barium cannot pass a certain point in the colon and thus the cecum is not defined although a large collection of gas appears at the site of the cecum.

A flat plate on admission and another after 24 hours of intestinal drainage by suction are significant if the last one looks the same as the first or if the localized gas collection is slightly larger than in the first one. It suggests closed loop obstruction.

The signs and symptoms are abdominal. The onset is usually slow but there is no definite sign or syndrome. The findings of intestinal obstruction are present some time after the onset of the symptoms.

The authors summarized 100 cases in the literature. Torsion in this group occurred at any age, but in 50 per cent of the cases it occurred between the ages of 20 and 45. Women and men were equally susceptible. The signs and symptoms usually were those of obstruction. There was considerable distention and a mass was often palpable.

Predisposing factors were pregnancy, previous operation, high roughage diet, strong catharsis, dietary indiscretions, and unusual exertion.

The mortality rate is high and is unaffected by the type of operation. However, early operation will definitely lower the mortality.

FREDERICK C. HOEBEL, M.D.

Myenteric Plexus in Congenital Megacolon: Study of 11 Cases. FRANCIS R. WHITEHOUSE and JAMES W. KERNOHAN. *Arch. Int. M.*, 1948, 82: 75.

On the basis of theoretical and experimental observations, it was the feeling of the authors that one approach to the study of the etiology and pathogenesis of congenital megacolon would be the study of the myenteric plexus (plexus of Auerbach) of the colon in cases of congenital megacolon in which postmortem examination had been performed. The myenteric plexus apparently has as its main function in the colon the conduction of stimuli and the co-ordination of movements and, as a result of such function, would be of importance in any consideration of the pathogenesis of congenital megacolon.

The myenteric plexus was studied by the authors in 11 cases of congenital megacolon, a series of cases used as controls, and 5 cases of secondary megacolon.

The myenteric plexus was found to be absent in the most distal part of the colon in all cases of congenital megacolon. In 80 per cent of the cases the myenteric plexus was absent also in the "transitional region." In 60 per cent of the cases the myenteric plexus was also absent in the lower part of the sigmoid. In 20 per cent of the cases the absence of the myenteric plexus extended from the rectum into the upper part of the sigmoid and descending colon.

In all cases of congenital megacolon there were nerves present in the location of the myenteric plexus which were not seen in the control cases.

The strategic location of these changes, a review of previous theoretical concepts, experimental production, and certain physiologic and anatomic studies pointed toward the significance of the changes in the myenteric plexus in the pathogenesis of congenital megacolon.

Surgical Treatment of Cancer of the Colon (La terapia chirurgica del cancro del colon). CARLO SPANGARO and ANTONELLO FRANCHINI. *Arch. ital. chir.*, 1949, 71: 17.

The authors analyze their results in the treatment of cancer of the colon. They include 146 patients

seen from 1932 to 1946. There was a slight majority of males. The ages varied from 30 to 84 years, with the highest incidence in the sixth and seventh decades.

Radical treatment was used in 66 cases, or 45.2 per cent. In 50, or 34.2 per cent, palliative measures were employed. Thirty, or 15 per cent, of the cases were inoperable. The cecum and transverse colon were most often amenable to radical resection, while the sigmoid and hepatic flexure were least often amenable to this procedure.

A right hemicolectomy was performed on 23 patients with a mortality of 43 per cent. Mikulicz resection was performed on 37 with a mortality of 24 per cent, and intraperitoneal segmental resection was performed on 6 patients with 4 deaths, a mortality of 66 per cent.

Palliative measures consisted of 28 colostomies on the right side with 9 deaths, and 20 colostomies on the left side with 1 death.

The most frequent cause of death was peritonitis. Only 2 cases of shock were seen. The most frequent cause of peritonitis was failure of the suture line to hold.

Among the complications, obstruction was the most common, being seen in 68 per cent of the cases and most often on the left side. This complication is considered to be a manifestation of an advanced process.

A study of the results showed that hemicolectomy resulted in a definite cure in 49 per cent of the patients, with 8 per cent showing metastasis in 2 or 3 years. The Mikulicz procedure resulted in cure in 51 per cent of the patients with evidence of metastasis or recurrence in 25 per cent in 2 or 3 years. The authors believe that any patient who lives for 3 years after operation should be considered clinically cured. LUCIAN J. FRONDUTI, M.D.

Wounds of the Colon and Rectum—A Critical Analysis of Current Methods of Surgical Treatment with Emphasis on Details of Surgical Technique. LEWIS S. PILCHER. *Mil. Surgeon*, 1949, 104: 188.

The author reviews the details of surgical technique which his extensive war experience demonstrated to be most effective in the treatment of wounds of the colon and rectum. While, in general, some form of exteriorization colostomy is the method of choice in the treatment of wounds of the colon, small single perforations of the colon may, on occasion, be closed by simple suture. Wounds of the rectosigmoid and rectum must be closed by suture, and a proximal diverting colostomy performed. For most wounds, tangential exteriorization or loop colostomy is the treatment of choice. Great care must be taken not to overlook a posterior or mesenteric perforation. Extensive injuries of the right colon are best treated by resection of the entire right colon with iliotransverse colostomy. The author does not believe that under wartime conditions the Lahey-Mikulicz technique of a double-barreled ileocolostomy is a satisfactory procedure. In any type of exteriorization procedure, great care must be exercised to prevent the colostomy opening from retracting below the skin level.

Under wartime conditions the Mikulicz spur colostomy did not prove entirely satisfactory. Loop colostomies proved to be more satisfactory and their closure could be carried out either extraperitoneally or intraperitoneally. If closed extraperitoneally, great care had to be taken to completely free the bowel from the transversalis fascia in order to avoid deformity and angulation; if performed intraperitoneally, care must be exercised not to suture through edematous bowel. Open methods of suture were preferred to aseptic anastomoses.

Intraperitoneal wounds of the rectosigmoid should be treated by suture and proximal diverting colostomy. Wounds of the extraperitoneal rectum and anus should be similarly treated, and the author stresses the need for suture of such wounds.

F. J. LESEMANN, JR., M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Pseudoscirrhous Carcinosis of the Liver (Carcinosi pseudoscirrosa del fegato). MARIO ALBERTO DINA. *Arch. ital. mal. app. diger.*, 1949, 15: 113.

The author describes 2 cases of cirrhosis of the liver with metastasis from an adenocarcinoma of the pancreas and from an adenocarcinoma of the ampulla of Vater. The clinical, and especially the anatomical characteristics of the disease present a peculiar picture which differentiates the condition from known neoplastic diseases involving the liver.

Macroscopically there was cirrhosis with major or minor reduction of the size, and with large fibrolardaceous and variegated interstitial bands. Histologically, there were isolated neoplastic tubules or cords invading the fibrous connective tissue. These were found in lacunae with endothelial walls, with invasion of the pseudolobular parenchyma from the periphery and the center.

The author proposes the theory of an endolymphatic infiltration of a secondary neoplasm in a previously cirrhotic liver. This would explain the scirrhous nature of the neoplasm which was absent at the site of origin. LUCIAN J. FRONDUTI, M.D.

Parasitic Cholecystitis (Colecistitis parasitarias). JOSÉ OVIEDO BUSTOS. *Prensa méd. argent.*, 1949, 36: 33.

Bustos believes that in the presence of a cholecystitis, particularly in the absence of stones, and in cases in which there is an associated zooparasitosis, the latter must be ruled out before other biliary factors are considered. In over 40 cases the following organisms have been found as primary or secondary invaders of the gall bladder: Lamblia or Giardia intestinalis, Fasciola hepatica, Ascaris lumbricoides, Endamoeba histolytica, hydatidosis, Taenia solium, Ankylostoma duodenale or Necator americanus. Considerable speculation is recorded concerning the

pathogenesis and mechanics involved in the parasitic invasion of the bile reservoir, whether or not the entrance was effected by an ascending or descending route through the canalicular or biliary ducts, through the liver, peritoneum, blood, or lymphatic systems.

Treatment primarily is directed against the parasites, and the specific for each type should be employed. If, during biliary surgery, the parasites are discovered, the antiparasitic drug should be introduced directly into the bile passages and into the duodenum. STEPHEN A. ZIEMAN, M.D.

Cholecystitis Emphysematosa. EDWARD E. JEMERIN. *Surgery*, 1949, 25: 237.

Cholecystitis emphysematosa is an inflammation of the gall bladder with grossly discernible gas formation. It is a rare condition, although possibly not quite as rare as the small number of reported cases would indicate. Despite the fact that the first cases in which gas was found in the gall bladder were described by Stolz in 1901, only 14 additional cases have appeared in the literature since that time.

Pathologically, emphysematous cholecystitis is an acute, usually gangrenous, inflammation of the gall bladder wall with bacteria growing in the wall and producing gas. The wall crepitates and foamy fluid can be expressed from it. The lumen of the organ fills with infected fluid and gas accumulates there as well, replacing the fluid contents partially or entirely. Destruction of the wall with extension of infection outside the gall bladder is quite common, so gas-producing pericholecystitis is also to be expected.

The clinical picture is that of a severe acute cholecystitis, with pericholecystitis in a high percentage of the untreated cases. A characteristic shadow on the plain roentgen film of the abdomen makes the diagnosis. Usually, during the first 24 to 48 hours no gas can be seen. There then appears the dark, pear-shaped shadow of gas outlining the usually distended gall bladder with the wall of the organ demarcated by contained gas as a darker circumferential shadow. Stones may be visualized as positive or negative defects within the gas. A fluid level should not be uncommon in films taken in the upright position. Within a few days the gaseous collection within the wall may become broader and stratified, and streaks or blobs of gas may be seen in the surrounding tissues, indicating extension of the infection into the pericholecystic area. The biliary ducts and radicals are not customarily outlined by gas.

Treatment should be surgical, but not all authors are in agreement with this point of view. Whether surgery should be done in the acute phase or in the interval is a moot point in ordinary gall bladder surgery and cannot be decided conclusively for this variety of acute cholecystitis either. It would seem that if chemotherapy will control the acute infection it would be wise to wait until this has subsided. However, with evidence of beginning spread beyond the confines of the gall bladder, prompt surgical intervention would seem to be the logical course to follow. Cholecystectomy is the operation of choice and should be performed whenever the general condition of the patient and the local findings will permit. Chemotherapy should, of course, be used in conjunction with surgery.

A case of cholecystitis emphysematosa is reported. This case of clinical acute cholecystitis with pericholecystitis showed the typical roentgen features of emphysematous infection. Gas was seen to fill the lumen of the gall bladder, to outline the wall, and to extend into the surrounding tissue. Because of uncontrolled diabetes and congestive heart failure, the immediate therapy was conservative. Apparent clinical subsidence of the acute phase was achieved. Operation was performed after 2 weeks, at which time the diabetes and cardiac status were well controlled, the patient was afebrile, and the abdominal signs had disappeared. Empyema of the gall bladder and pericholecystic abscess containing gas under tension were found. Clostridium oedematiens in pure culture was obtained from the pus. The gall bladder was necrotic and contained stones, one of which was impacted in the cystic duct. A right subphrenic collection was also found. The gall bladder was removed, and the subhepatic and subphrenic spaces drained. The postoperative course was entirely smooth for 10 days, the wound healing per primam and the operative site remaining soft and nontender. A chill with high fever occurred on the tenth day with a blood culture positive for Bacillus coli. Penicillin therapy was started immediately and within 2 days the temperature was normal. However, on the thirteenth day a severe cerebral accident occurred. The patient developed oliguria and lapsed into coma from which she never roused, and died on the twenty-fourth day after operation. Left ureteral obstruction with pyonephrosis was found at autopsy, and probably accounted for the transitory Bacillus coli bacteriemia. The operative site was clean and death was attributed to the cerebral accident.

CHARLES BARON, M.D.

Observations on the Technique of Subserosal Cholecystectomy (Bedeutung der Technik der subserosen Cholezystektomie). R. DEMEL. *Wien. med. Wschr.*, 1949, 99: 23.

The author recommends that the operation of cholecystectomy be performed in a retrograde fashion commencing at the junction of the cystic and common ducts and proceeding toward the fundus of the gall bladder. In this manner injury to the common duct or hepatic artery, as well as to the liver, is prevented. Also, hemostasis is secured by the control under direct vision of the several blood vessels bridging the space between the liver and the gall bladder.

Normal saline solution is injected beneath the serosa along either side of the gall bladder so that the subserosa is distended with fluid. The serous coat can then be incised without injury to either the gall bladder or the liver. The serosal cuffs, preserved by

the procedure, are sutured together to reperitonealize the gall bladder fossa. If the cuffs of serosa cannot be preserved the liver may be approximated over the raw gall bladder fossa with interrupted sutures.

The author insists upon the use of a simple rubber tube for drainage of the operative area. The tube usually is removed within 4 to 6 days.

The technique of subserosal retrograde cholecystectomy is applicable for both acute and chronic cholecystitis, with or without stones, as well as for empyema or perforation of the gall bladder.

ORVILLE F. GRIMES, M.D.

The Surgical Problem of Periampullary Cancer. GEORGE T. PACK and ROBERT J. BOOHER. *Arch. Surg.*, 1948, 57: 71.

The authors present their experiences in 5 cases of periampullary cancer in which the radical operation of pancreaticoduodenectomy was performed. They believe that the presence of neoplastic biliary obstruction necessitates surgical attack on the biliary duct system, the pancreas, and the duodenum. Metastasis occurs in less than 25 per cent of the cases of periampullary cancer, and death usually occurs as a result of interference with the flow of bile. Almost two-thirds of cancers of the duodenum are periampullary.

Suprapapillary and infrapapillary cancers of the duodenum do not cause early symptomatology, as do periampullary tumors, and therefore the rate of operability is not as great, and metastases are more likely to have developed by the time that patients come to surgery. The results of surgery are also better in periampullary tumors than in other carcinomas of the duodenum and of the pancreas.

The development of the radical operation of pancreaticoduodenal resection with choledochojejunostomy, pancreaticojejunostomy, and gastrojejunostomy by Whipple and others is described. A growing tendency toward standardization of the operation is apparent.

In the group of 5 patients whose cases are presented the symptoms were gradual in onset. The predominant symptom in 4 of the patients was painless jaundice and itching, and in the remaining case the early complaint was epigastric pain, which was followed by intermittent jaundice. This is in contrast to other reports of cases in which pain was an outstanding early symptom in many of the patients. All 5 of the authors' patients had insidious anorexia with loss of weight, and 2 patients had enlarged livers and distended gall bladders. All patients presented a distended gall bladder and common duct at operation, and this indicates the value of Courvoisier's law to the surgeon. Chills and fever occurred in one patient; this is not unusual. Melena occurred in 2 patients and severe secondary anemia in 3 patients (including the 2 with melena). This signified an ulcerating duodenal lesion which, when associated with obstructive jaundice, would indicate an ulcerated peripapillary tumor.

The diagnosis was difficult in the absence of jaundice, and particularly so when the carcinoma occurred in the pancreas. Awareness of the condition is therefore a necessary first step toward the diagnosis, as most cases begin with malaise, chills and fever, gastrointestinal symptoms, loss of weight, anorexia, and weakness. A palpable mass is an important physical finding. Roentgenologic studies were helpful in 2 of the 5 cases. Laboratory studies were not of great value in this series because of the variable stages at which the patients presented themselves.

When the diagnosis of obstructive jaundice is made, early surgery is indicated if a good resectability rate is to be attained with a long survival rate. The survival rate is very low for patients who have been ill for as long as 6 months before operation.

The difficulty of diagnosis at the operating table has been demonstrated by the fact that some patients in whom resection is done for carcinoma prove to have pancreatitis, and other patients with conditions diagnosed as pancreatitis are found at later operations to have carcinoma.

In the authors' cases the outstanding complication was pancreatic fistula, which occurred in 3 cases in spite of ligation of the pancreatic ducts and careful closure of the stumps. This indicates the wisdom of performing a pancreaticojejunostomy. Ascending cholangeitis was prevented by placing the biliary gastrointestinal anastomosis at a good distance proximal to the gastroenterostomy.

The article is accompanied by roentgenograms, microscopic slides, and schematic drawings of the operations performed. Four radical pancreaticoduodenectomies and one local excision were performed. One patient survived for 3 years after operation and another, whose cancer was still resectable 2½ years after onset, is still living after 4 years. One death, 3½ months after operation, was the result of biliary and pancreatic fistula. One patient is alive and apparently well 1 year after operation, and 1 patient had recurrence 9 months after operation. ERNEST D. BLOOMENTHAL, M.D.

Chronic Recurrent Pancreatitis: Clinical and Laboratory Aspects. Serial Serum Diastase Levels Following Prostigmine Stimulation. WILLIAM A. KNIGHT, JR., R. O. MUETHER, and ANNE J. SOMMER. *Gastroenterology*, 1949, 12: 24.

The authors review 58 cases of chronic recurrent pancreatitis. The most common symptoms were upper abdominal pain, weight loss, malaise, nausea, vomiting, food intolerance, anorexia, constipation, and weakness. Occasionally a low grade fever lasting for months was the presenting symptom. Hematemesis or melena occurred in 23 per cent of the cases. Pain is an almost constant feature of chronic recurrent pancreatitis and may be epigastric in location, referred to the back, or to either upper quadrant. Physical findings were inconstant and minimal. Mild upper abdominal tenderness was usually present.

The most helpful laboratory test was the serum diastase level which was found to be elevated in 64 per cent of the cases. Extremely low serum diastase levels may be seen in far advanced pancreatic disease. The glucose tolerance test, serum cholesterol, and stool examinations are of little aid in the diagnosis of chronic recurring pancreatitis.

In an effort to devise a more accurate laboratory test for chronic recurrent pancreatitis, a study was made of the response of the serum diastase levels of patients with normal and diseased pancreas to prostigmine methylsulfate. In the control series the serum diastase values showed very little variation following the injection of prostigmine methylsulfate; however, in 41 cases with chronic pancreatic dysfunction serial serum diastase levels following injection of the drug demonstrated significant changes in the diastase levels.

In general, the variations in patients with this disease may be classified into four types: in the first type a high fasting diastase level was present and following injection of the drug there was a progressive fall in the level; the second type of response was an initial rise followed by a progressive fall; the third type of response was a progressive rise following prostigmine stimulation; and the fourth type of response was in those patients who initially had a low diastase level, and in whom there was but little change following the prostigmine stimulation. The authors believe that the response of the serum diastase levels to prostigmine stimulation is a worthwhile test in patients with chronic pancreatic disease.

F. J. Lesemann, Jr., M.D.

Carcinoma of the Pancreas. Howard K. Gray. *Arch. Surg.*, 1948, 57: 763.

In the preface of his exhaustive work on the surgery of pancreatic tumors, Brunschwig has stated that the pancreas has been regarded as the "hermit organ" from the surgeon's standpoint because of the rarity with which operations have been performed on it and because surgeons have been reluctant to undertake such procedures, often fearing the development of acute pancreatitis as a complication of the operation itself. The complexion of this dismal situation has changed rapidly, however, in the last 15 years, owing to the abundant information that has accumulated relating to diagnosis, preoperative and postoperative care, and surgical technique. Not the least factor has been a willingness on the part of many surgeons to challenge and to conquer this natural aversion to direct surgical attack on the pancreas and, by so doing, to demonstrate that partial, and even total, pancreatectomy can be done without imposing undue risk.

It has been stated that two main types of pancreatic carcinoma are observed: (1) cylindric cell carcinoma, arising from the ducts, and (2) carcinoma simplex, arising from the parenchyma.

It is ironical that carcinoma of the head of the pancreas should become manifest in many instances when the lesion is small enough to permit complete surgical excision, and yet be so placed that it may be extremely difficult, if not impossible, to make a positive diagnosis. This refers in particular to small carcinomas of the head of the pancreas that produce extrinsic pressure against the terminal portion of the common bile duct and produce obstructive jaundice. The terminal portion of the common bile duct descends along the posterointernal aspect of the bend joining the first and second parts of the duodenum and then along the inner side of the second part, where it is surrounded more or less by the head of the pancreas. Because of this anatomic arrangement, any attempt to obtain tissue for microscopic examination will entail a rather extensive surgical procedure unless the surgeon is fortunate enough to withdraw sufficient malignant tissue by exploring the common duct from within. It is rare that a specimen of the desired tissue can be obtained for biopsy in this manner in the early stages of obstruction because infiltration of the walls of the common bile duct by cancer will not have occurred, and the examining scoop or tissue extractor will encounter only a duct that is compressed from external pressure. It is also ironical that carcinoma of the body or tail of the pancreas (where surgical removal could be accomplished with the least difficulty and risk) should become manifest in many instances when the lesion is so extensive that complete surgical excision is not possible.

Although there is no method whereby the surgeon can accurately recognize the presence of a malignant lesion of the pancreas, much valuable information can be obtained from a carefully taken history and from the results of physical and laboratory examinations.

Pain of *some* character has been noted by practically all observers in the majority of cases.

When the lesion involves the head of the pancreas (approximately 75 per cent of cases), jaundice will be present in practically all cases. The nature of this jaundice may give an invaluable lead as to the underlying pathologic condition, for it is usually marked and constant. The remissions that are seen so commonly associated with stone in the common bile duct are absent, and because of the depth of the jaundice (occasionally as much as 60 or 70 mgm. of bilirubin may be observed in 100 c.c. of serum) pruritus is marked and many factitial areas may be seen on the skin.

The presence of jaundice and a distended gall bladder may suggest obstructive jaundice due to carcinoma of the head of the pancreas or of the bile ducts below the orifice of the cystic duct, but this combination is by no means pathognomonic. The presence of deep, persistent jaundice, continuous acholia and a distended gall bladder may be considered a more reliable diagnostic complex.

Cachexia and loss of weight usually are symptoms of advanced carcinoma and in most instances will be present in a patient in whom the malignant condition has progressed to the point at which surgical excision of the lesion is no longer possible.

Laboratory data are of inestimable value, particularly in the presence of jaundice.

Appreciable elevation of the content of lipase in the serum was noted in about 37 per cent of a series of cases of pancreatic cancer. Because this phenomenon probably was due to obstruction of the pancreatic ducts and/or associated pancreatic inflammation, it was thought to be significant in the diagnosis of cancer of the pancreas.

Studies of hepatic function show no remarkable deviation from that seen in obstructive jaundice arising from other causes, except perhaps in degree, for alteration of hepatic function is dependent on damage to the parenchyma of the liver.

The recognition of carcinoma of the islands of the pancreas may present an insoluble diagnostic problem, for it is well known that even though surgical exploration of the pancreas is carried out, an adenoma or carcinoma of the islet cells is not always demonstrable and definitely incriminated as the cause of a patient's spontaneous hyperinsulinism and associated hypoglycemia.

Although occasional instances of hypoglycemia undoubtedly are hepatogenic, the minimal reduction of sugar in the blood in itself rarely causes symptoms, and therefore the spontaneous occurrence of the clinical syndrome ascribed to hypoglycemia should make the physician acutely aware of the possibility of a benign or malignant islet cell tumor.

In review of the records of patients suffering from this unusual disease, it is interesting to note that an appreciable number of patients will be familiar with the fact that sugar will abort an attack, and have become accustomed to carrying candy or sugar with them at all times. The attack of hypoglycemic coma may be mistaken for drunkenness by the average layman, and it has not been an unusual experience to find that a patient has been discharged from his position on the mistaken assumption by his employer that he had been imbibing too freely.

Surgical treatment would seem to be indicated in practically all cases in which the presence of a carcinoma of the pancreas has been recognized, if for no other reason than to offer palliative relief from a condition that is unbearable. In view of the fact that the majority (60 to 70 per cent) of malignant tumors of the pancreas are situated in the head, and that most of these produce complete and persistent jaundice, the surgeon is justified in attempting to restore the flow of bile into the stomach or intestine if it is seen that radical removal cannot be effected.

Should there be any uncertainty as to the diagnosis, a period of observation may be indicated in order to permit determination of the general course of the disease.

The patient who is suffering from the hepatogenous type of jaundice is more likely to be harmed than benefited by operation.

In the absence of jaundice, the diagnosis of carcinoma of the pancreas is extremely difficult to make, and therefore the indications for surgical intervention are obscure. The decision to explore will have to be made when other diagnoses have been discarded through a careful process of elimination. It is probable that more patients should undergo exploratory operations than are being operated on at present, for by such a course it will be possible to attack the disease when it is still amenable to surgical removal.

The author discusses preoperative preparation, and operative and postoperative treatment.

Role of Splenectomy in Thrombopenic Purpura. GEORGE BOGARDUS, J. GARROTT ALLEN, LEON O. JACOBSON, and CHARLES L. SPURR. *Arch. Surg.*, 1949, 58: 16.

Clinical data based on 20 cases of idiopathic thrombopenic purpura are presented. Ten of the patients in this group were treated medically, and 10 were subjected to splenectomy. Seven of the 10 patients treated medically were known to have had no recurrence for a period of from 6 months to 2 years. Five of the 10 splenectomized patients had a recurrence; in 2 of these it was severe. Of the patients who had a recurrence, 3 had the acute disease and 2 had chronic disease. Opinions concerned with the pathologic processes in thrombopenic purpura are discussed. The importance of the capillary abnormality, as well as the low platelet count, is emphasized. It is possible that the condition of the entire reticuloendothelial system, and not of the spleen alone, determines the course of the disease.

BENJAMIN GOLDMAN, M.D.

Fever Following Splenectomy (La febbre degli splenectomizzati). LUIGI TORRACA. *Gior. ital. chir.*, 1948, 4: 675.

The author discusses fever following splenectomy. In certain cases a mild fever, which cannot be explained on the basis of infection or absorption, is present for several weeks. He analyzes 8 cases following splenectomies which he performed. Two patients had fever for more than 2 weeks. This represents 25 per cent, comparable to the 27 per cent reported by Saarenmaa of the Helsinki Clinic.

Among the theories which are discussed as to the cause of the fever are the following: (1) ligation of the tail of the pancreas, (2) formation of exudate in the operative area, and (3) collection of blood in the splenic bed. Other theories are mentioned.

The author concludes that all these theories are merely hypotheses which do not adequately explain the cause of the fever. He agrees with Tansini in considering it a problem which is still to be solved.

LUCIAN J. FRONDUTI, M.D.

MISCELLANEOUS

The Coexistence of Intra-Abdominal Lesions in Patients with Epigastric Hernia. JOHN M. HOFFMAN and GREGG D. WOOD. *Surgery*, 1949, 25: 566.

In a tabulated review of 76 patients admitted to the Portland (Oregon) Veterans' Hospital, the

authors found 24 cases of associated epigastric hernia and upper abdominal disease.

The symptoms of epigastric hernia are characterized as (1) a sharp finger-point lancinating pain on straining, well localized to the hernial ring where filaments of the lower intercostal nerves are impinged, and (2) the deep, boring, aching pain aggravated by eating or bending backward, produced by a drag on the greater omentum, greature curvature of the stomach, or falciform ligament of the liver. Pain is relieved on reduction of the mass, or on lying down, and is aggravated by straining, bending backward, or eating a full meal. Thirty of the 76 patients entered the hospital with these symptoms.

Patients with added vague ulcer or digestive symptoms should be thoroughly investigated and even given a trial medical regimen, to rule out coexisting visceral disease, before simple hernioplasty is done. Careful preoperative roentgenograms of the stomach for evidence of gastritis or ulcer, of the gall bladder for disease, and of the colon for disease or malposition, are considered essential, inasmuch as these diseases were predominantly coexistent.

JANE C. MACMILLAN, M.D.

Abdominal Lymphadenitis; Study of 40 Observations (La lymphadénie abdominale; d'après l'ètude de 40 observations). JOEL MEGNIN. *Rev. chir.*, Par., 1949, 68: 12.

The affection which, in the United States, is known as mesenteric lymphadenitis is a syndrome rather than a pathogenetic entity. It occurs most frequently in the second decade of life.

The author differentiates three clinical forms: acute, subacute, and chronic. The pathologic anatomy is not very characteristic except for an enormous swelling of the mesenteric lymph nodes, especially in the ileocecal area. The lymph nodes, which normally are the size of a hemp seed, are increased to lentil or bean size; they are smooth, gray, or pink, and of a special translucent aspect. Although the ileocecal location predominates, enlarged lymph nodes are often found disseminated over the entire abdominal cavity. Histologically they present diffuse hyperplasia, especially of the reticular and endothelial elements.

The etiology of the condition is still an open question, and various writers differ considerably in their opinions. In 1921, Brenneman, in America, suggested that the affection accompanies or follows tonsillitis or other streptococcic infections of the throat. Streptococci were found in a vast majority of cases on throat culture. The author doubts this theory of the "Brenneman syndrome." Probably a multitude of factors may lead to mesenteric lymphadenitis. Systemic infections such as influenza, pneumonia, measles, scarlet fever, and even poliomyelitis and osteomyelitis are mentioned by the author. On the other hand, intestinal disturbances such as parasites, appendicitis (acute and chronic), and terminal ileitis may play a causative role.

The author discusses 40 personal cases. Of these, 21 patients were operated upon. He includes in his statistics cases of acute purulent appendicitis on the one hand, and abdominal tuberculosis on the other. (Abstractor's note: This is surprising, since these conditions should be separated from the syndrome of mesenteric lymphadenitis as it is understood in the United States). WERNER M. SOLMITZ, M.D.

Subphrenic Abscess. R. S. HUNT. *Brit. J. Surg.*, 1948, 36: 185.

The present report is based upon 12 cases of subphrenic abscess. Each case is described separately and the anatomy of the subphrenic spaces is briefly discussed.

One patient was found to have a single abscess on the left side secondary to a perforated peptic ulcer; another had abscesses on both left and right sides, secondary to a carbuncle of the left kidney. In all other cases abscesses were on the right, most of them being right posterior, and in general the etiologic factors were either appendicitis or perforated ulcer. However, in 3 cases the condition was secondary to amebic dysentery and in 1 case the abscess was of unknown etiology.

The following conclusions were drawn:

The recognition and early treatment of any predisposing condition, such as appendicitis or peptic ulcer, is of prophylactic value. The predisposing causes must be treated "thoroughly" in order to obtain the best results and prevent relapses. Early drainage is indicated as soon as the diagnosis is made. Diagnostic aspiration or "needling" should be avoided in order to prevent spread of infection or damage to other intra-abdominal organs. The extraperitoneal approach should always be employed. Extreme caution should be observed in order to avoid the splenic flexure in rare left-sided cases. Because of the varied organisms found on culture, both penicillin and sulfonamides should be used. Finally, the infection seldom corresponds to the anatomical boundaries of a subphrenic space, as it sometimes occupies part of a space and frequently is present in more than one location.

SAMUEL J. FOGELSON, M.D.

GYNECOLOGY

UTERUS

Visualization and Photography of the Uterine Canal. W. B. NORMENT. *North Carolina M. J.*, 1948, 9: 619.

As a result of many years of attempting to visualize and study the uterine canal, an instrument was devised which consists essentially of a metallic sheath similar to a urethroscope and containing a metal obturator. After the sheath is inserted through the cervix into the uterine canal, the obturator is removed. A second metallic sheath containing the optical system and closed at the end with a transparent window is then inserted through the first sheath. The two sheaths that cover the optical system are air tight and the insertion of the second closed sheath carries a column of air into the uterine canal which causes a slight dilatation which is advantageous for study. This investigation may be done under pentothal sodium or a low spinal anesthetic. It is thus possible to inspect the inside of the uterus and, for the purpose of further study, photographs may also be taken by a camera attached to the optical system. This instrument is an aid in intrauterine diagnosis and is especially valuable for guidance to the exact site where diagnostic curettement should be made. SAMUEL J. FOGELSON, M.D.

Clinical Signs of Adenocarcinoma of the Cervix Uteri (Zur Klinik des Adenokarzinoms der Cervix uteri). H. DRESCHER. *Geburtsh. & Frauenh.*, 1949, 9: 31.

Seventy-nine patients with adenocarcinoma of the cervix were treated by the author. In suitable cases an operation, namely, an abdominal or vaginal total hysterectomy, or Wertheim's operation, was done and supplemented by preoperative and postoperative x-ray treatments. In 50 per cent of the operable cases a cure was obtained. In the remaining cases fractional x-ray treatment was combined with applications of radium.

Forty-three patients, or 54.4 per cent of the entire group, were operable and a 5 year cure was obtained in 24 per cent of the entire material.

Cylindrical cell carcinoma is less radiosensitive than flat cell cancer, contrary to the flat cell carcinoma of the cervix and the adenocarcinoma of the corpus uteri. The adenocarcinoma of the cervix spreads to the parametria in its early stages. While the squamous cell cancer advances in a wide front, the adenocarcinoma forms clusters of cells separated by normal tissue. This type of advance is much faster than that of the squamous cell cancer.

Unlike cancer of the body of the uterus, cancer of the cervix occurs much more frequently in multiparas than in nulliparas. However, in the author's material the number of nulliparas was twice as large as would be expected.

The author concludes from his study that the results of irradiation in adenocarcinoma of the cervix, with or without operation, are nearly as good as those in cancer of the cervix in general.

JOSEPH K. NARAT, M.D.

Fibromyxochondrosarcoma of the Cervix Uteri (Fibromixocondrosarcoma del cuello uterino). José M. CID and José L. BOVERI. *Obst. gin. lat.-amer.*, 1948, 6: 554.

The authors present an exhaustive case study of a rare uterine tumor. The patient, a 24 year old tripara, had been operated upon for a benign cervical polyp 1½ years previous to her present admission. Metrorrhagia recurred and 10 months later she submitted to a cervical amputation. After a period of 6 months there was recurrence of vaginal bleeding, and on examination at this time a fungating mass which bled freely on the least manipulation was seen attached to the left cervical wall. Microsections revealed a mixed sarcoma. Considerable speculation with regard to the histogenesis of the tumor brought out several theories regarding the formation of these tumors. The possible sequence appears to be as follows:

Because of constant association of the tissues which constituted the tumors, the existence of this link is regarded as sequential and not accidental. The formation of a precartilaginous blastema and the production of a benign cervical chondroma is conceivable. Malignant sarcomatous alteration of this chondroma and its mesenchyma matrix is the next step, with regression of the cartilaginous components due to local factors. The disembryoplastic origin of the tumor suggests the existence of aberrant embryonal germinants since the neoplasm did not show any characteristics of the region involved.

STEPHEN A. ZIEMAN, M.D.

The Role of Surgery in the Treatment of Carcinoma of the Cervix. CHARLES D. READ. *Edinburgh M.J.*, 1948, 55: 675.

In any discussion on the subject of the treatment of carcinoma of the cervix, division of opinion invariably centers around the relative merits of radiation and radical surgery. This generally applies only to cases coming within the category of stages 2 and 3. In many clinics the Wertheim operation was abandoned when radiotherapy became generally established, but at the author's hospital the radical surgical operation has been practiced continuously, but lately in rather carefully selected cases only.

In his "all out" surgical attack on carcinoma of the cervix, Victor Bonney, between the years 1907 and 1936, performed 500 consecutive Wertheim operations. His operability rate was 63 per cent of all cases seen and his series included stage 1, 2, and 3 growths. His operative mortality was 14 per cent.

In these 500 operations, there was malignant involvement of the regional glands in 200 patients, while in 300 patients the glands were free of growth. The 5 year cure rate in the gland-free cases was 53 per cent, and the corresponding cure rate in the gland-involved cases was 22 per cent. A further analysis of Bonney's results, taking into consideration the 37 per cent of patients not subjected to surgery, shows an absolute cure rate of 25 per cent.

The results of radiotherapy are quoted and compare more than favorably with those of surgery, but in spite of either method of treatment, a considerable number of patients die from the disease.

Since 1936 at the Chelsea Hospital for Women, 14 per cent of the patients with carcinoma of the cervix have been subjected to the Wertheim operation. The operative mortality was 8.3 per cent. With a more careful selection of cases, it is fair to assume that the operative mortality would have dropped to about 4 or 5 per cent as a result of the improved anesthesia, blood and plasma transfusions, penicillin, the sulfa drugs, and good nursing.

The selection of cases for the radical operation today is largely confined to those presenting the following: (1) radioresistant growths; (2) columnar-celled (adeno) carcinoma of the cervix; (3) stenosis of the vaginal vault; (4) large fibroids, ovarian tumor, or salpingitis; (5) refusal of radiation by the patient, and (6) pregnancy complicating cervical cancer.

During the years from 1936 to 1941, 54 radical operations were performed on stage 1 and 2 growths. The uncorrected 5 year survival rate was 44 per cent; the corrected rate was 50 per cent.

The author has performed the radical operation following radiotherapy on 42 occasions. Previous radiation does magnify the technical difficulties of the operation to some extent, but provided the growth still conforms to Stage 1 or 2, it is always removable.

So far as can be assessed, the rate of carcinomatous gland involvement is approximately as follows:

Stage 1.....from 20 to 25 per cent
Stage 2.....from 30 to 35 per cent
Stage 3.....from 40 to 50 per cent
Stage 4.....over 60 per cent

The author suggests that radiation may not successfully sterilize the pelvic lymphatic field of carcinomatous deposits, as is illustrated by histological examination of excised nodes following a full course of treatment by radium and deep x-ray therapy. He believes that there is a place for lymphadenectomy in selected Stage 3 cases which have been cured locally by radium, and that such a procedure could well be extended to Stage 2 cases and selected cases of Stage 1.

As for the operation, lymphadenectomy is performed early in the operation immediately after it is ascertained that the bladder can be satisfactorily displaced downward. At least the upper half and preferably the upper two-thirds of the vagina are removed. The ureters and bladder are treated with the greatest gentleness. Over the past 12 years the incidence of postoperative urinary fistula has been 3.1 per cent. GEORGE BLINICK, M.D.

Discussion of Certain Findings at Autopsies of Patients with Cancer of the Uterus (Considerazioni su alcuni reperti di autopsie di pazienti affette da cancro dell 'utero). F. MARCHESI. *Quad. clin. ostet. gin.*, 1948, 3: 675.

Among 11,693 autopsies there were 82 cases of cancer of the uterus, but 24 of these had to be excluded from the review because the autopsies were incomplete.

In 53 cases of the remaining 58 the cancer was primary and in 5 it was secondary. In 37 cases the cervix was the primary site of the cancer and in 16 the fundus was the primary site.

The author attempted to establish the cause of death in each instance. He divided the causative factors into three groups: (1) direct, namely neoplastic invasion of the lesser pelvis, peritoneal carcinosis, or metastases in the liver or brain; (2) indirect, such as cachexia or renal insufficiency, and (3) intercurrent, such as infectious peritonitis or decompensation of the heart.

Cancer of the cervix caused the formation of fistulas and the infiltration of adjoining organs more frequently than cancer of the fundus.

The frequency of brown atrophy of the liver was greater and that of fatty degeneration of the liver less in cases of cervical cancer than in cases of cancer of the fundus.

Atrophy of the spleen was recorded in 32.4 per cent of the cases of cervical cancer, while septic tumefaction of the same organ was found in 31.2 per cent of the cases of cancer of the fundus.

In 29.1 per cent of the cases of cervical cancer there was hydronephrosis with atrophy of the renal parenchyma; in 24.3 per cent, fatty degeneration; and in 32 per cent, dilatation of the ureters. On the other hand, the frequency of renal lesions in cases of cancer of the fundus was of no practical importance.

The vesical wall was invaded in 24.3 per cent of the cervical cancers and in 6.2 per cent of cancers of the fundus.

The author concludes from his review that the greatest effort should be made to avoid secondary infections and to maintain the anatomic and functional integrity of the urinary apparatus, especially in cases of cervical cancer.

JOSEPH K. NARAT, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Surgical Indication of Hysterectomy with Castration in Hydatidiform Mole (Indication chirurgicale de l'hystérectomie avec castration dans la môle hydatiforme proliférante). CH. FLAMAND. *Acta. chir. belg.*, 1948, No. 8: 483.

The author reports a case of hydatidiform mole with very rapid development and a poor general con-

dition of the patient. At 3 months of pregnancy the uterine fundus was at the level of the umbilicus, continuous small hemorrhages had been present for 4 weeks, the patient complained of continuous dull abdominal pains, the hemoglobin was 55 per cent, and the gonadotropic hormone in the urine was 40,000 units. According to Aschheim and Zondek the last finding is a classical sign of hydatidiform mole, the titer in normal pregnancy being between 500 and 4,500 units. In view of the rapid growth, the extreme softness of the uterus, the probability of incomplete evacuation by curettage, and the poor general condition of the patient, the author decided on hysterectomy. As, at laparotomy, the ovaries appeared enormously enlarged (of more than fist size), hyperemic, and polycystic, they were removed with the uterus.

The author discusses in detail the indications for hysterectomy in hydatidiform mole. He believes that the operation is indicated only in such extreme cases as the one reported. In the individual case the decision will depend not only on the rapidity of uterine growth and the general condition but also on the parity of the patient.

In the light of recent researches, not too much value can be ascribed to the gonadotropic titer. It has been shown that abnormally high titers sometimes also occur in normal pregnancies as well as in hyperemesis gravidarum. WERNER M. SOLMITZ, M.D.

MISCELLANEOUS

Irradiation of Spleen (Die Milzbestrahlung). RICHARD KURT KEPP. *Geburtsh. & Frauenh.*, 1949, 9: 24.

The mechanism of the effect of irradiation of the spleen remains obscure. Probably products of decomposition of cells under the influence of x-rays are responsible for the rise of coagulability of the blood.

In many instances, irradiation of the spleen not only causes cessation of the uterine bleeding, but also re-establishes the normal cycle. This effect is possibly attributable to hormonal relations between the spleen and the ovaries. The author irradiates from a distance of 40 cm., with the use of 110 roentgens, 180 to 200 kilovolts, and a copper filter 0.5 c.c. thick.

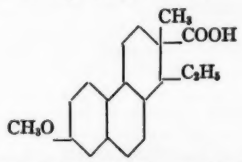
At the University of Goettingen, irradiation of the spleen in the treatment of juvenile menorrhagias, functional hemorrhages of women, preclimacteric uterine bleeding, and hemorrhages due to inflammatory processes of the adnexa, or essential thrombopenia, has been followed by good results.

A cessation of juvenile bleeding was recorded in two-thirds of all cases, and in one-half of them a normal menstrual cycle was re-established. Seventy-five per cent of all patients with uterine bleeding caused by an inflammation of the adnexa reacted favorably.

If the proper technique is employed, the method is considered harmless. JOSEPH K. NARAT, M.D.

Clinical Study of 1 Methyl Bisdehydrodoisynolic Acid. A New Synthetic Estrogen (Etude clinique de l'acide 1 methyl bisdehydrodoisynolique. Un nouvel oestrogene de synthese). ALBERT NETTER, MICHEL JAMES, and G. MATHÉ. *C. rend. Soc. fr. gyn.*, 1948, 18: 272.

This compound, 1 methyl bisdehydrodoisynolic acid, of strong estrogenic activity, has been prepared by Miescher who gave it this name in honor of the American author, Doisy. The formula is:



The authors studied this new drug in a series of 33 patients, 18 of whom were in the menopause, 12 had had castrations, and 3 had amenorrhea. The substance is given by mouth only. Doses of from 20 to 30 mgm. re-establish normal vaginal cytology in castrated women. In 2 cases of ovariectomized but not hysterectomized patients, doses of from 20 to 30 mgm. produced uterine hemorrhage. Pruritus vulvae was relieved in 2 women in the menopause. The clinical effect on hot flashes, headaches, palpitations, and angiospasms of the extremities was much less marked than that of estradiol.

WERNER M. SOLMITZ, M.D.

OBSTETRICS

LABOR AND ITS COMPLICATIONS

Medical Treatment of Uterine Inertia (Sul trattamento medico dell 'inerzia uterina). ROBERTO PICCOLI. *Arch. ostet. gin.*, 1948, 53: 276.

The efficacy of the association of estrogen with the posterior lobe hormone, and that of sparteine sulfate alone or associated with spasmolytic substances have been studied in 53 cases of uterine inertia. Of 19 patients with simple inertia and early rupture of the membranes, 16 were treated by the oral administration of 4 mgm. of diethylstilbene and the intramuscular injection of 3 units of extract of the posterior lobe 4 hours later; in the other 3 patients, 3 mgm. of the synthetic estrogen were injected intramuscularly. Before the institution of treatment in all of the cases, the complete absence of uterine contractions was constantly verified by palpation for at least 2 hours. In 13 patients the pregnancy was at term, in 3 it was in the seventh month, and in 3 it was in the eighth month. The presentation was podalic in 2 cases and normal in the others.

In 11 patients uterine contractions started about 3 hours after the administration of estrogen, and in the others within 30 minutes of the administration of the posterior lobe hormone. In 16 patients labor proceeded regularly and spontaneous delivery occurred without complications in an average of 11 hours and 10 minutes. In 2 patients the estrogen treatment started the contractions, but they were of little use and came at rather long intervals even after administration of the posterior lobe hormone. Delivery was obtained after 22 hours by the application of forceps in the first case and in the second case it occurred spontaneously after 33 hours. In the remaining patient, a multipara in the seventh month of pregnancy with ruptured membranes for more than 24 hours and a podalic presentation, the treatment was ineffective in that it caused only weak contractions for 3 hours, and delivery was obtained only after a foot was brought down and traction applied.

Of 34 patients with secondary inertia of the dilatation and expulsion period, 22 were given sparteine sulfate alone in doses ranging from 9 to 20 cgm., while 12 were given 20 cgm. of the drug with 3 cgm. of paverine.

In the first group, sparteine failed in 2 patients and was effective in the others (90.9 per cent). In from 10 to 20 minutes it caused good contractions which resulted in spontaneous delivery in 65 per cent of the patients, and in more advantageous conditions for operative delivery in the remainder. The contractions caused by sparteine usually last from 30 to 40 seconds and occur at intervals of 3 to 5 minutes. The best results are obtained with doses over 15 cgm. The duration of the action of the drug varies from 2 to 4 hours, but it is seldom necessary to repeat the dose.

In the second group, which consisted of primiparas with simple inertia in whom the borders of the incompletely dilated cervix appeared to be rigid, or in whom the uterus was hypertonic or strongly applied to the fetal body, sparteine associated with papaverine caused spontaneous delivery within a short time in 7 instances and facilitated operative delivery under favorable conditions in 3, but it failed in 2 instances. The association of spasmolytic substances with sparteine does not interfere in any way with the oxytocic action of the latter. RICHARD KEMEL, M.D.

Dystocia in Face Presentation (Distocia en la presentación de cara). DIEGO TAYLOR GOROSTIAGA and ROBERTO E. LEDE. *Prensa méd. argent.*, 1949, 36: 143.

The authors, in an elaborate article generously illustrated, discuss the various possible positions of fetal face presentation and the necessity for precise diagnosis of the condition. Every aid should be utilized for this purpose and the criteria for accurate diagnosis are given.

The management of this condition is presented. This includes expectant therapy or manipulation when some disproportion exists. The details of reduction and orientation are enumerated.

The causes for face presentation are given as twofold and listed as primary and secondary, whereas factors which limit expectant therapy and contribute to the high fetal mortality (from 12 to 50 per cent) involve the maternal organs, their pathophysiologic processes (dystocias), and malformation of the fetus. Considerable judgment and experience are required to decide upon the precise time for surgical intervention as well as to choose the type of surgery suited for the particular case at hand. This is usually determined by the presentation, whether high or low, and the relationship of the maternal and fetal parts.

The various manipulation schemes are discussed; they include rotation, the use of forceps, internal version, symphysiotomy, and cranioclasis.

STEPHEN A. ZIEMAN, M.D.

Dystocia Due to Obstructing Tumors (Distócia por tumores prévios). A. WOLLF NETTO. *An. Fac. med.*, S. Paulo, 1948, 2: 23.

Obstructing tumors may be genital (uterine malformations, ovarian, uterine, vaginal, and vulvar neoplasms) or extragenital (originating in organs close to the uterus, such as the pelvis, rectum, bladder). They make the normal course of parturition impossible by preventing dilatation of the cervix, or engagement and progression of the fetus through the pelvic canal, or by producing abnormal fetal positions and presentations. Sometimes the dystocia is only apparent and during the course of labor the tumors spontaneously leave their obstructing position and present no further impediments to parturi-

tion. When this does not occur, the obstructing tumor requires the intervention of the obstetrician.

Tumors obstructing the pelvis are not exceptional complications of labor. Neoplasms of the uterus, and, especially, myomas of the cervix and the lower segment in aging primiparas and in pluriparas with few births or long intervals between them, are the most frequent. In decreasing order of frequency the tumors are: ovarian neoplasms (dermoid, pseudomucinous and serous cysts, carcinoma, and sarcoma) and tumors originating in the tissues and walls of the pelvis. Obstructing tumors of the vagina and vulva or those constituted by a pelvic ectopic kidney, fecalomas, vesical calculus, and malignancy of the rectum and bladder are extremely rare. The diagnosis is not always easy and is based on the origin of the tumor, its aspect, consistency, localization, fixation, or mobility. Parturition by the natural route may occur because of the softness or small volume of the tumor, its ascension, or its artificial or spontaneous rupture. If the pelvic obstruction is such as to prevent birth by the natural route and this fact is not recognized, the patient ends by dying from infection or uterine rupture. The treatment of this dystocia must be surgical; it depends on the nature of the tumor but has cesarean section as its basis, which procedure can nowadays be considered rather safe. When it is impossible to displace the tumor manually and to obtain descent of the fetus, this operation becomes imperative and, with or without extirpation of the tumor, solves the problem with decreased maternal and fetal mortality.

The author classifies and discusses the genital and extragenital obstructing tumors, and emphasizes the role played by uterine myomas and cystic tumors of the ovary. He reports 2 cases. In the first, the dystocia was due to a uterine myoma which at first was thought to be a low insertion of the placenta, although there was no hemorrhage. After careful examination the diagnosis of obstructing submucosal myoma was made and it was realized that the localization of the tumor made its extirpation easy. The cervical dilatation was completed and the myoma was removed by torsion of its pedicle. The membranes were then artificially ruptured and the fetal head became engaged. Birth occurred normally 3 hours later. In the second case the dystocia was due to a vulvar tumor and the entire perineal region was occupied by a giant papilloma which obliterated the vaginal orifice nearly completely and made examination impossible. Segmental cesarean section was performed and the tumor was removed by thermocautery 3 months later. RICHARD KEMEL M.D.

Cesarean Section in Contaminated Cases—A Résumé of 1,138 Observations (La cesárea en el caso impuro [A través de 1,138 observaciones]). JULIO BAZÁN, FRANCISCO A. URANGA IMAZ, and CARLOS D. SCHIAVO. *Bol. Soc. obst. gin.* B. Air., 1948, 1948: 571.

This is a critical comparative study of the treatment of cesarean section in contaminated cases without and with chemotherapy and antibiotics. It extends from 1928 to 1948. With the low section technique and drains, the mortality from peritonitis and infection for 172 cases was 4.06 per cent (from 1928 to 1933). Surprisingly, this figure remained about the same up to 1943 despite variations in operative procedures and care. In 1943 when sulfonamides were employed the rate dropped to half (2.13 per cent). Significantly enough, with improved bacteriologic studies, correct identification of the invading organism, and the employment of specific sulfa-antibiotic combinations, the mortality rate from 1945 to 1948 was reduced to zero in 195 contaminated cases.

Emphasis is placed on culturing of the organism, the skillful operative technique without trauma, and the maintenance of high sulfa-antibiotic concentrations of the blood by local and parenteral means.

STEPHEN A. ZIEMAN, M.D.

Obstetrical Uterine Rupture in Finland During the Years 1936 to 1943, Especially from the Point of View of Preventive and Clinical Treatment (Ueber die obstetrischen Uterusrupturen in Finnland waehrend der Jahre 1936–1943, insbesondere vom Gesichtspunkt der Praeventiven und Klinischen Behandlung aus betrachtet). P. O. PÄRNÄNEN. *Acta obst. gyn. scand.*, 1949, 28: Supp. 6.

The author analyzes all cases of obstetric uterine rupture occurring in Finland during the years 1936 to 1943. He reports a total of 103 ruptures among 593,251 deliveries (.017%). The maternal mortality was 53.4 per cent and the fetal mortality, 93.3 per cent. The ratio of multiparas to primiparas was 96 to 13.

So-called violent or traumatic rupture accounted for 17 cases (16.5 per cent of the total). The majority of these followed forceps application and version. In a few cases rupture occurred following craniotomy and embryotomy.

Spontaneous ruptures (86 cases, or 83.5%) were divided as follows: (1) those caused by rupture of a scar (45.4%); (2) mechanical obstruction to delivery (38.4%); (3) pathologic changes of the uterine wall, e.g., neoplasm (9.3%); (4) miscellaneous factors, e.g., pendulous abdomen (2.3%); and (5) undetermined factors (4.6%).

Ruptures of a uterine scar presented the best maternal prognosis (25%). The most usual mechanical obstruction was a narrow pelvis. Two of the 33 cases in this latter group were precipitated by the administration of oxytocics.

The symptoms varied. Classical symptoms of an imminent uterine rupture were frequently absent. At times signs of internal hemorrhage suddenly appeared. It was a common feature for ruptures of scars to be preceded by pain in the region of the scar, perhaps even several weeks beforehand. Nearly 80 per cent of all ruptures occurred within 1 week of term, and four-fifths of these should have been considered early in pregnancy as definite hospital deliveries.

The prognosis seemed to depend primarily on the degree of shock, the severity of hemorrhage, the presence of infection and duration of the rupture before treatment was instituted. Of secondary importance was the general condition of the patient, mode of transportation of the patient to the hospital, and the skill of clinical care.

The author proposes certain principles of management: after instituting therapy for hemorrhage and/or shock, definite treatment should preferably consist of wound toilet, and then, if circumstances permit, suture of the rupture; otherwise supravaginal hysterectomy rather than complete hysterectomy should be done. Packing is ill-advised. In patients with persistent hemorrhage the uterine cavity should be emptied either vaginally or by the abdominal route. An empty, retracting uterus is the best security for the control of hemorrhage. It is significant that the mortality among women attended by general practitioners was 77.3 per cent; among those under the supervision of specialists the mortality was only 24.3 per cent.

WARREN R. LANG, M.D.

MISCELLANEOUS

Roentgenologic Study of the Pelvic Viscera in the Pregnant Woman (Etude radiologique des visceres pelviens chez la gestante). M. FOURNIER. *C. rend. Soc. fr. gyn.*, 1948, 18: 202.

Five normal pregnant women, at or approaching term, were studied roentgenologically. Three of these were primiparas and 2 had had a childbirth previously. A sixth woman who clinically presented symptoms suggesting placenta praevia in the sixth month of gestation was later, on Cesarean section, found to have a placenta praevia centralis.

The technique consisted in partially filling the bladder with a shadow medium (tenebryl B). A small barium enema was given by rectum and the vagina was rendered visible by mere inunction of the walls and plications with a thin layer of opaque substance. The roentgen rays were centered between the greater trochanters so that the two shadow contours coincided for the exposures in profiles, and from the middle of the symphysis to the middle of the promontory.

From the experience in these 6 cases it is concluded that cystography will often show a much greater thickening of the inferior uterine segment than vaginal examination with the fingers would lead one to suspect. Although the exact location of the placenta cannot always be found, even when it occupies the lower uterine segment, without a careful study of the relationships also offered by the rectum and the uterus, nevertheless the method is peculiarly susceptible for confirming the clinical diagnosis of placenta previa. On the other hand, in the absence of the signs of abnormal distance between the bladder and the presenting part, and between the rectum and the presenting part, a clinical diagnosis of placenta previa can be discounted.

The author reasons that the method might also apply to other forms of forelying obstructions of the birth canal, such as tumors, fibromas, or cysts.

The roentgenographs show the close relationship between the upper end of the vagina to the rectum in the normal woman at term and explains the frequent injuries to the rectum in vaginal tears. They also show how closely the bladder is molded over the foregoing part contained within the lower uterine segment and the ease of injury to the bladder in tears of this segment. JOHN W. BRENNAN, M.D.

Abortions, Premature Births, and Weight of the Newly Born During the War Period (Aborti, parti prematuri e peso dei neonati in periodo di guerra). PIERO MUTTI. *Ann. ostet. gin.*, 1948, 20: 750.

The contradictory reports of various authors who had studied the subject of newborn infants in the two world wars led Mutti to make his own investigation, using the material observed at the Obstetric and Gynecologic Clinic of the University of Cagliari during three periods—the prewar period from 1939 to 1940, the war period from 1941 to 1944, and the postwar period from 1945 to 1946.

He found that the average incidence of abortions had remained nearly uniform, in the neighborhood of 19 per cent, during the three periods. However, the slight increase in premature births to 16.5 per cent during the war period, as compared to 15.6 per cent during the postwar period, was lower than the 17.35 per cent average of the prewar period, and especially the 20.08 per cent of 1939 which constituted the highest point of the curve.

On the basis of 2,614 clinical records referring without doubt to births at term, the average weights of the newborn were 3,291 gm. for the prewar period, 3,316 gm. for the war period, and 3,308 gm. for the postwar period. Consequently, instead of the expected decrease in weight during the war period, there was a very slight increase. Various factors may have contributed to this stability of the weight of the newborn in Sardinia. The war period on this island was shorter than in Northern Italy where the problem has been studied particularly. The island is principally an agricultural region and it is probable that the dietary deficiencies which are capable of profoundly altering the general condition of the mother did not occur here as they did in the other parts of Italy. Pluriparity, in which the weight of the newborn tends to increase with each successive pregnancy, reached its highest point on the island during the war. As a result of the transfer to the island of numerous families of soldiers, many children considered as islanders were really of continental origin, and their average weight at birth was generally higher than that of children belonging to the region. With the influx of continental elements and the intermarriage with island girls, there must also have been some influence on the average weight of the newborn in the direction of an increase.

Mutti also found an increase in the average weight of the newly born offspring of women who were in

excellent health but had been admitted to the clinic at least 15 days before delivery.

RICHARD KEMEL, M.D.

Remarks on Total and Prolonged Retention of the Placenta in Abortion (Considérations sur la rétention totale et prolongée du placenta dans les avortements). R. BURTHIAULT. *Rev. fr. gyn. obst.*, 1948, 43: 374.

Among a series of 2,534 abortions the author observed 47 cases in which the entire placenta was retained for more than 4 days after expulsion of the fetus. This situation presents several diagnostic and therapeutic problems.

In the first place, if no absolute proof of expulsion of the fetus has been given (observation by a physician), the diagnosis is not certain. It may be a case of threatened abortion, and the patient may have made a false statement, purposely or otherwise. In this case, nothing should be done for a month unless hemorrhage or infection necessitates intervention.

Another difficult problem is the correct evaluation of fever. Although in the vast majority of cases it indicates infection, cases are not rare in which low or high grade hyperthermia (up to 40 centigrades or higher), even with repeated chills, is caused by resorption rather than by infection. Frequently these attacks occur just before expulsion of the placenta. The differential diagnosis depends on the local findings. In the absence of fetid lochia and of tenderness of the uterus, parametria, or cul-de-sac, infection is not likely to be present. In addition, blood cultures should be done in severe cases.

The author suggests the following management:

If the existence of pregnancy and the expulsion of the fetus have been established beyond doubt, evacuation by curettage is justified. However, as curettage in these cases is a long and laborious process, inducement of expulsion by quinine should be tried first.

If hemorrhage without infection is present, vaginal packing should be done for from 12 to 24 hours as this procedure often induces spontaneous evacuation. This may be followed by curettage after the cervix is open.

In cases of infection, antibiotic and chemotherapy should be used unless rare complications like peritonitis or gangrene of the uterus make laparotomy necessary. Curettage should not be performed earlier than a week after the temperature has returned to normal.

WERNER M. SOLMITZ, M.D.

Three Cases of Osseous Metaplasia of the Cytogenous Stratum of the Endometrium. Pathogenesis of This Condition. (Trois cas de métaplasie osseuse du chorion cytogène de l'endomètre. Aperçus pathogéniques). P. BROCQ, P. FEYEL, and A. SLUCZEWSKI. *Gyn. obst.*, Par., 1948, 47: 613.

According to the authors, their cases are the first ones ever published of true osseous metaplasia in the endometrium. In view of the uniqueness of the observations, it seems warranted to report the individual cases briefly.

A patient, 30 years of age, had undergone prolonged treatment with testosterone propionate for cystic lesions of both breasts. Biopsy of the endometrium on the twenty-ninth day of the cycle revealed a normal picture of the uterine glands corresponding to the end of the luteinic stage although traces of glycogen persisted in the cytoplasm of the glandular cells. However, the basal layer of the mucosa showed, imbedded in normal tissue, lamellae of true bony substance containing osteoblasts. These trabecula-surrounded areas are filled with cells of the typical character of bone marrow. Other portions showed an anhistic substance between the glandular tubules giving the picture of a network with wide meshes. In these meshes were found multinuclear cells which had the aspect of osteoblasts, whereas the anhistic substance surrounding the meshes represented a preosseous material.

A second biopsy 4 months later did not reveal any signs of osseous metaplasia.

Another patient, 37 years of age, underwent repeated curettages for menorrhagia of several years' duration. The tissue produced by the second curetting contained numerous lamellae of spongy bone, the medullary spaces of which were filled with hemorrhagic material.

The third patient, 48 years of age, was hysterectomized for a fibroid. Examination of the amputated uterus revealed a platelet of bony substance at the posterior wall at the level of the isthmus. This piece of bone had the size and shape of a fish scale.

The authors do not claim to explain these quite exceptional occurrences. On the basis of experiments, they rule out the possibility that treatment with testosterone may cause osseous metaplasia in the endometrium. As the endometrium in all 3 cases showed signs of hyperfolliculinism, they offer the hypothesis that this anomaly may have some connection with the osseous metaplasia.

WERNER M. SOLMITZ, M.D.

EDITOR'S NOTE

Radiodiagnosis in Gynecology and Obstetrics. Radiodiagnosis in Obstetrics (Le radiodiagnostic en gynécologie et en obstétrique. Le radiodiagnostic en obstétrique). A. GINGLINGER. *Gyn. obst.*, Par., 1948, 47: 481.

The illustrations comprising Figure 1 in the abstract entitled, "Radiodiagnosis in Gynecology and Obstetrics. Radiodiagnosis in Obstetrics," which was published in our April issue (1949, 88: 351) originally appeared in the *Zentralblatt fuer Gynaekologie* (1941, 65: 114) in an article entitled "Further Experiences with My Methods of Intra-Amnionic Injection of Thorium (Fetal Organography)" by K. Ehrhardt.

GENITOURINARY SURGERY

ADRENAL, KIDNEY AND URETER

The Histological Lesions of 32 Suprarenal Capsules Removed Surgically for Permanent Arterial Hypertension (Lésions histologiques de 32 capsules surrénales enlevées chirurgicalement pour hypertension artérielle permanente). P. WERTHEIMER and A. GUICHARD. *Lyon chir.*, 1949, 44:15.

This article reports a 10 year study by the same pathologist of 240 suprarenal glands, 208 of which were removed at autopsy and 32 that were removed surgically for essential permanent arterial hypertension.

The 32 suprarenal glands removed surgically were taken from 10 men and 22 women whose average age was 46 years. These patients had permanent essential arterial hypertension without Bright's disease.

The capsule of the suprarenal gland in this group was found to be totally or partially fibrosed. The capillaries were dilated, the arteriole lumens were either partially or totally hyalinized, and were associated with an obliterative endarteritis of variable intensity. Occasionally, small islands of inflammatory leucocytes were encountered.

The glomerulosa (zona glomerulosa) was usually found to have disappeared either totally or partially. At times there was a fibrosis dissecting the zone, isolating cellular strands and associated with interstitial fibrosis of the outer capsule as well as of the deeper portions of the gland.

The spongiocyte layer (zone fasciculata) was always hyperplastic. This finding represented the essential attribute of the suprarenal gland of the hypertensive patient. Occasionally, this hypertrophy was really due to the atrophy of the other two layers. Sometimes it was of the cellular type, giving rise to swollen, distended, gigantic spongiocytes. At times small cellular lobules were present; at other times large multinucleated cells, syncytial in type and separating the individual spongiocytes from each other, were found.

The zona reticularis occasionally was found to be normal. It was rarely found to have disappeared, but it was often thickened. Sometimes it was the site of a clear atrophic sclerosis radiating from the capsule or the medulla.

The medulla, on the contrary, was rarely hypertrophied, but it was found occasionally to be the site of atrophy or fibrosis.

In all zones, lymphocytic islets were found which had not been previously described in the literature. These collections of lymphocytes were thought by the authors to represent an important histopathological finding in the suprarenal gland of the hypertensive patient.

The size of these small micronodular masses varied; sometimes there were 5 or 6 parts, while at other times macronodular formations consisting of a score of parts were found.

Some plasmocytes, eosinophils, Russell bodies, and histocytes were found in all zones, but the cell most often found was the lymphocyte. Sometimes these lymphocytes were found in small islets, in dense plaques, or mixed cells with a predominance of the lymphocytic cell.

The authors found the capsule to be normal in 15 of the 32 cases and altered in 53 per cent of the cases. The glomerular zone was modified in 46 per cent of the cases studied. The spongiocyte layer was involved in 71 per cent of the cases. The reticular layer was altered in 53 per cent, or 17, of the 32 cases. The medulla was normal in 20 of 32 cases and altered in 37 per cent, hyperplastic in 10 of 12 cases, fibrosed in 3 of 12 cases, and reduced in size in 1 case.

The lymphoid islands were, because of their frequency and their unusual character, the most unusual findings in this study of the suprarenal glands of the hypertensive patient.

The study also included 208 suprarenal glands, 50 of which had been associated with medical or surgical vascular syndromes. In 158 cases the pathological process was unrelated to the arterial hypertension.

In general, the changes in the suprarenal glands resembled those found in hypertensive disease, but they occurred less frequently, in 87 per cent of the cases as against 100 per cent of cases in the hypertensive group. Hypertrophy of the spongiocyte layer (zona fasciculata) and of the medulla was common to both groups of cases. Endarteritis with hyalinization of the capsule and, particularly, reticulocyte hyperplasia, on the contrary, were more common in the hypertensive disease group. The lymphoid nodules were found less frequently and in fewer numbers in the cases of arteritis.

The disappearance of the glomerulosa and of the lymphoid islets was always characteristic of the medical type of hypertension, but hypertrophy of the spongiocyte layer was rare and very limited.

The suprarenal gland changes were in a sense identical in the course of the three types of disease. They were found most constant (in 100%) and most developed (XXX) in surgical arterial hypertension, in 87 per cent and less developed (XX) in arterial disease, and in 73 per cent and least developed (X) in medical arterial disease. These percentages were practically nonexistent in the 158 cases observed by the authors.

In a study of the suprarenal glands in 158 patients of various ages and sexes, presenting diseases such as rheumatism, endocarditis, infection, pulmonary tuberculosis, or blood dyscrasias, the authors found alterations in the suprarenal glands in 21 per cent as compared to 87 per cent of the pa-

tients with arterial disease, 100 per cent of those with surgical hypertension, and 73 per cent of those with vascular sclerosis.

It was not possible to decide from the material studied what produced the hyperfunction of the suprarenal gland in the cases of permanent arterial hypertension, nor was it possible to determine what caused the disappearance of the glomerulosa, and the hypertrophy of the spongiocyte layer with pigmentary changes in the reticular layer and medulla. This study suggested to the authors the advisability of suprarenalectomy for the treatment of certain hypertensive patients and of certain vascular syndromes.

In résumé, the authors studied the histological lesions found in 32 cases in which the suprarenal glands were surgically removed for permanent arterial hypertension. In this group of cases they noted the disappearance of the glomerular zone, hyperplasia of the spongiosa and an increase in the number of islets of lymphocytes. They concluded that these histopathological changes had distinctive characteristics not found in any other disease entity.

CONRAD A. KUEHN, M.D.

Instrumental Visualization of the Renal Pelvis. HARRY R. TRATTNER. *J. Urol.*, Balt., 1948, 60: 817.

Renal exploration for lesions which cannot be accurately identified by pyelography leaves much to be desired. If the lesion is not apparent in the exposed cortex of the kidney, intrarenal exploration by means of various types of incisions often fails to reveal a "hidden lesion," causes considerable renal damage, and presents problems in hemostasis.

To overcome this shortcoming in renal examination, the author presented a "nephroscope" (a modified cystoscope) by means of which the interior of the renal pelvis and calices may be visualized when the kidney is exposed surgically. The nephroscope is composed of a 24 F. straight sheath equipped with 3 telescopes; namely, right angle, fore-oblique, and forward. Grasping forceps can be used with any of the telescopes. A "renal pelvis valve adaptor" is devised to be secured in the incision by a purse-string suture; through this adaptor the sheath of the instrument can be introduced. This device is for the purpose of reducing trauma to the renal pelvis.

The author calls attention to the fact that the kidney must be well exposed (by means of rib resection when necessary), and that the renal pedicle must be of sufficient length and elasticity to allow sufficient mobilization of the kidney for examination. Various types of renal pelves and calices were discussed from the standpoint of the facility with which examination might be carried out by means of the nephroscope. The author presented drawings to illustrate the various appearances of infundibula, minor calices and pyramids. It is possible by use of this instrument to visualize epithelial tumors, stones, and other pathologic conditions which might otherwise be missed. It is obviously impossible, however, to visualize all of the ramifications of the calices, except in a minority of cases.

Among the contraindications for the use of this instrument which the author mentioned are (1) conditions which do not permit sufficient mobilization of the kidney with safety; (2) inaccessibility of the renal pelvis because of its type or pathologic involvement; (3) conditions in which it is thought that introduction, injection, or aspiration of fluid into and from the renal pelvis is likely to result in extension or dissemination of an infective process, as in the majority of acute inflammatory conditions and in known cases of renal tuberculosis.

JOHN L. EMMETT, M.D.

Perirenal Abscess. OLA OBRANT. *Acta chir. scand.*, 1949, 97: 338.

In order to establish the results of incision and drainage of perirenal abscesses, investigate the sequelae of the disease, and consider possible alterations in treatment, the author undertook a study of 32 cases of perirenal abscesses in patients previously operated upon during the period between 1920 and 1945. The 32 cases were divided into two groups. The first group comprised 18 cases in which perirenal abscess was secondary to staphylococcal infection of the kidney parenchyma (pyonephritis), and the second group comprised 14 cases in which the etiology was pyelonephritis (infection in the renal pelvis and parenchyma).

In evaluating the statistical data, it was noted that abscesses occurred somewhat more frequently on the right side than on the left. Etiologically, staphylococci were the only organisms isolated in the first group, while various strains were found in the second group. The abscesses were located most commonly inferior to the kidney. None were reported medial to the kidney.

Pain in the renal area, lumbar region, and abdomen was common; however, pain in the legs, joints, and buttocks occurred also in some patients. Anterior abscesses often simulate appendicitis and cholecystitis. Urinary symptoms occurred in 1 patient in Group 1, and in 3 patients in Group 2, with pyuria in the latter group but only bacteria in the former. Leucocystosis was variable, with normal counts occasionally encountered. Fever and an elevated sedimentation rate were rather constant findings. Palpable resistance in the loin was a frequent important finding, but only occasionally was it associated with fluctuation in either group. Roentgenological examination is of paramount importance in the diagnosis. Roentgenograms frequently showed obliteration of the psoas shadow, kidney shadow, a visible mass in the loin, fixation of the kidney on respiration, and calculi, which occurred in 6 cases.

Treatment consisted primarily of incision and drainage. Only 2 patients received chemotherapeutic agents, while none received antibiotics. Of the original number of 32 patients, 18 are living and adequate follow-up examinations were made on 16. The renal shadow on the diseased side was visible in all but 2 patients. In 6 patients in Group 1, relative

fixation of the earlier diseased kidney was noted; in Group 2, only one patient revealed this finding, and in 6 cases the findings were relatively normal. Blood pressure findings were inconsequential.

Of the 18 patients in the first group, 14 are living and well; death of 2 patients was due to disease unrelated to the perirenal abscess. In Group 2, only 4 patients are living, and 2 of these have fistulas. Six patients in Group 2 died as a direct result of perirenal abscess and 4 died as a result of the operation.

The author states that generally it is not satisfactory to treat perirenal abscesses (pyelonephritis) by incision and drainage. In nearly all cases there has been some serious disease in the kidney or urinary system, such as concretions, pyonephrosis, infected hydronephrosis, etc. Treatment must be directed against the associated disease as well as the perirenal abscess. PETER L. SCARDINO, M.D.

Treatment of Papillary Tumors of Ureter. VINCENT J. O'CONOR. *J. Urol.*, Balt., 1949, 61: 488.

The author believes that the prognosis in papillary tumors of the renal pelvis and ureter has been spectacularly improved by earlier diagnosis and application of complete nephroureterectomy. This contrasts with the prognosis for cortical renal tumors in which modern surgery has made little progress toward the prolongation of life.

There is at present a lack of definite knowledge as to the etiology of papillary carcinoma of the renal pelvis and ureter, aside from the fact that these lesions are often associated with the presence of stones and chronic infection. There is a generally accepted idea that there must be some irritant to the urinary epithelium by a carcinogenic agent of local origin or one which has been carried to this epithelium by the blood or lymph. Fagerstrom considers epithelial crypts and buds to be bizarre expressions of epithelial hyperplasia and he does not support the theory of cell rests as proposed by Von Brunn. He was unable to develop any evidence that solid epithelial buds are directly associated with the origin of solid tumors of the urinary epithelium.

The author deems it unwise to regard any tumor of the renal pelvis or ureter as being anything but potentially malignant. Incomplete measures such as local excison or destruction are not to be condoned except in unusual circumstances, such as absence or inadequacy of the other kidney. The treatment of choice in dealing with these primary tumors is complete nephroureterectomy with removal of a cuff of the bladder. Incomplete ureterectomy is often followed by recurrence or subsequent tumor development in the ureteral stump, the intramural portion of the ureter, or in the bladder mucosa. These secondary tumors are usually more extensive and less amenable to destruction than the primary tumor.

In support of these conclusions a series of 482 nephrectomies was reviewed. Seventy operations were done for renal or ureteral tumor. There were 14 (2 squamous, 12 papillary) primary renal pelvis tumors with secondary implants in the ureter or bladder. Complete procedures were done in 9 cases. In 6 of these the patients are alive for periods varying from 4 to 22 years. Two cases with incomplete nephrectomy were followed to ultimate death, one within 8 years and the other within 12 years after operation, with no evidence of recurrence at autopsy. Several other cases in which an incomplete nephrectomy was done, including a case in which the intramural portion of the ureter was treated by electrocoagulation from without, are listed as showing metastasis in the bladder and pelvis. Of 6 patients operated on elsewhere for papillary tumors of the renal pelvis, 4 died of the primary disease. There were 2 patients seen after being subjected to incomplete operations for tumors of the ureter, both of whom had recurrences in the stump of the ureter with small papillary tumors of the bladder.

ALLAN K. SWERSIE, M.D.

Carcinoma of the Ureter. JOHN HERMAN LONG. *J. Urol.*, Balt., 1949, 61: 23.

A case of primary carcinoma of the ureter is discussed, and a brief review of the literature is submitted, as well as an analysis of pertinent data relative to this entity. Primary ureteral neoplasm occurs either as an epidermoid or as a papillary carcinoma. The condition is observed twice as frequently in males as in females, and occurs in the sixth and seventh decades of life. The lesion occurs twice as often in the right ureter as in the left, and in the lower third of the ureter twice as frequently as in the upper two-thirds. Hematuria, pain, and an enlarged kidney occur secondary to obstruction by the tumor; ureteral tumor is palpable abdominally, rectally, or vaginally, and lymph nodes may be enlarged. Cystoscopic and roentgenological examinations aid in the diagnosis.

The treatment of choice is extraperitoneal nephroureterectomy with segmental resection of the bladder. Metastases are said to occur in 34 per cent of the reported cases, with spread to the retroperitoneal lymph nodes, liver, bones, and lungs. A mortality of 25 per cent is recorded, but no patient living more than 4 years after operation died of metastases.

The author recommends periodic follow-up examinations at 3 month intervals during the first year, at 6 month intervals during the second, third, and fourth years, and yearly thereafter.

PETER L. SCARDINO, M.D.

Transureteropyelostomy and Transureteroureterostomy. THOMAS D. MOORE. *J. Urol.*, Balt., 1948, 60: 859.

In selected cases in which pathologic conditions affect the lower part of only one ureter, it may be desirable to preserve the kidney rather than to perform nephrectomy. Among the conservative operations which have been employed toward this end are reimplantation of the ureter into the bladder, implantation into the bowel, and anastomosis to the normal ureter of the opposite side.

The author reports 1 case of anastomosis of one ureter into the ureter on the opposite side, and 1 case of transureteropelvic anastomosis (anastomosis of a ureter to the pelvis of the opposite kidney) which to his knowledge is the first to be reported in the medical literature. The latter case was that of a woman 30 years of age, who had bilateral ectopic (pelvic) kidneys and backward flow of urine up the left ureter; this caused periodic pain, infection, chills, and fever. The left ureter was isolated, severed from the bladder, brought down through a tunnel under the posterior parietal peritoneum, and implanted into the right renal pelvis, with successful results.

Among the indications for these two types of operative procedure, the author lists: unilateral ureteral reflux; surgical ureteral trauma; sloughing of the ureter subsequent to its extensive mobilization and interference with the blood supply; pathologic conditions, either neoplastic or inflammatory, which extensively involved the lower ureter; primary ureteral tumors, either benign or of low grade malignancy, and intractable ureteral strictures.

An account of the author's preliminary operations on animals to determine the feasibility of transplanting a ureter to the opposite renal pelvis is presented. The author calls attention to the fact that, as yet, the successful implantation of a ureter to the opposite renal pelvis of a normally situated kidney in a human being has not been reported. Such a procedure has been performed on cadavers and he is confident that it can be done successfully.

JOHN L. EMMETT, M.D.

BLADDER, URETHRA, AND PENIS

Cystectomy in the Male. The Significance of the Combined Prostatoseminal Vesiculocystectomy with Special Reference to the Sexual Function. RAGNAR ROMANUS. *Acta chir. scand.*, 1949, 97: 389.

The author comments on the various reports which have been made in the literature concerning the operation of cystectomy. He has found (with but one exception) that publications say nothing concerning the sexual function in men after cystectomy.

The author's material consists of 49 cystectomies performed on male patients during the years 1940 through 1947. This operation was performed on 8 patients with extensive papillomatosis of the bladder, 3 patients with severe chronic cystitis with contracted bladder, and 38 patients with vesical cancer and malignant papilloma. Among these 49 patients the prostate was extirpated in 29 cases, and in 28 of these the seminal vesicles were also removed. In 4 of the 20 other cases the prostate was cut approximately in the middle, while in 16 cases it was left largely intact; in 5 of the 16 it was left untouched, and in the remaining 11 cases the division was made through the upper part of the prostate, or the first part of the urethra was cauterized.

During the first years of the period covered by this report, the prostate and the seminal vesicles were routinely left intact in cystectomy. They were removed only if pronounced adhesions were found with fixation of the bladder to the vesicles, and an extravesical extension was suspected. As a rule, the prostate was removed in cases of tumor in the neck of the bladder with extension to the prostate, and in cases in which changes giving rise to the suspicion of malignancy were observed in the prostate before or during the operation. Of late years, the indications for removal have not been so strictly limited and often are taken out chiefly for technical reasons.

An analysis of the radicality of the operations performed revealed that one argument for removal of the prostate and vesicles was the finding in 6 cases of cancer of the prostate, some of which were unsuspected.

A number of complications have occurred in more or less definite relation to the type of operation performed. There is a tendency for the clamp to slip, owing to division through the prostate instead of distal to the apex.

On 2 occasions fistulas or cavities have arisen which were possibly connected with necrosis of remaining prostatic tissue.

It was the author's impression that urethral drainage was of value in the prevention of retropubic cavities. Epididymitis was found in 3 cases. In 1 instance rectal injury was occasioned when dividing the membranous part of the urethra with diathermy.

Data concerning the sexual function before and after extirpation of the bladder was obtained from 21 patients, comprising 10 in whom the prostate and the seminal vesicles were left, 4 in whom the seminal vesicles were left while the prostate was partially removed, and 7 in whom the prostate and the seminal vesicles were completely removed. In the 10 who had intact prostate and seminal vesicles, 7 enjoyed unchanged sexual function after the operation. There was, however, a temporary impairment in at least 2 cases. In the remaining 3 patients the function has been impaired: in 2, in direct relation to the operation and in one secondarily through a subsequently occurring prostatovesiculitis about 5 years postoperatively. In 4 patients the prostate was partially removed, the vesicles being left intact; 2 of these had unchanged sexual functions after the operation but the amount of semen was small.

The last group comprises 7 patients in whom both the seminal vesicles and the prostate were removed. Two of these had unchanged or only slightly impaired sexual function after the operation (apart from the fact that there has been no ejaculation); 1 patient had at first a normal erection but soon died of another disease; 3 patients had inhibited functions after the operation which, in at least 2 cases, may be ascribed to the primary disease and its complications without direct relation to the type of surgery; 1 patient had for a period following the operation a normal libido but was impotent, presumably a consequence of the operation.

In view of these findings the author believes that the disturbances of sexual function which have been

described in connection with operations on the prostate and seminal vesicles must not be ascribed solely to the removal of these organs. Similar changes appear after abdominoperineal extirpation of the rectum and after operations upon the sympathetic nervous systems. These disturbances should therefore more probably be ascribed to nerve injuries sustained in connection with the operation than to the loss of the organs themselves. In an uncomplicated abdominal cystectomy, with removal of the prostate and the seminal vesicles, the dissection of the organs is chiefly made bluntly in the prevesical space and its continuation. Thus, the main nerve plexuses are left undamaged.

On the basis of the present material it is not possible to judge whether the risk of sexual disturbance after cystectomy is greater in connection with removal of the prostate and the vesicles than it is if these organs are left intact. The material is not extensive enough, and it has been selected on the principle that chiefly the most severe cases have been subjected to prostatovesiculectomy and, as a whole, those subjected to this procedure have had a comparatively poor general condition and impaired renal function.

The author's experiences with these 21 patients show that despite the removal of both the prostate and the seminal vesicles, the sexual potential may be normal, i.e., the erection normal, the course of the coitus normal, ending in a normal orgasm but of course without ejaculation. As secondary complications may arise from apparently normal seminal vesicles and prostate left behind at operation, these organs should, on principle, be removed in all cases of malignant vesical tumor, and only in cases of clearly benign changes in patients for whom it is particularly desirable to retain fertility should the preservation of the prostate and the seminal vesicles be considered. ROBERT O. BEADLES, M.D.

Artificial Urinary Bladder. SEYMOUR W. RUBIN. *J. Urol.*, Balt., 1948, 60: 874.

In this article (awarded first prize by the Committee on Scientific Research of the American Urological Association), the author stated that the important problem to be solved in cases of total cystectomy is not the removal of the bladder, but rather the successful disposition of the ureters. A complete review of the literature concerning ureterointestinal anastomosis and experimental attempts to form an artificial urinary bladder is given. A complete bibliography is appended.

Because of the frequency of ascending renal infection and ureteral obstruction after transplantation of ureters to the bowel, the author has sought another method for diposing of the ureters when cystectomy is necessary. He presented a review of his work on dogs, in the formation of an artificial bladder from an isolated portion of the sigmoid colon. The operative technique is presented in detail. Briefly, it consists of isolating a 6 to 10 cm. loop of sigmoid and re-establishing the continuity of the bowel by end-to-end anastomosis. The isolated loop of sigmoid, with its intact musculature, is displaced to the right and its proximal end is closed with sutures. The ureters next are severed from the bladder and anastomosed to the sigmoid loop over ureteral catheters. The bladder is then removed, and the distal end of the isolated loop is anastomosed to the proximal end of the severed urethra.

The operation was successfully performed in 7 of 11 dogs. The dogs were continent, and habits of micturition were almost normal.

The important observation was that postoperative studies did not reveal evidence of pyelocaliectasis or ascending renal infection. The length of postoperative observation varied from a few weeks to 7½ months. At the time of the report there had been some infection in the artificial bladder, but it had been easily controlled with urinary antiseptics. The author stated that there is no reason why this procedure should not be tried on human beings.

JOHN L. EMMETT, M.D.

MISCELLANEOUS

Barge-Bourgain's Reaction in Genitourinary Tuberculosis. O. SIEVERS and TH. BERGLIN. *Acta chir. scand.*, 1949, 97: 283.

In 1946 Pirot, Barge, and Bourgain reported on the results of a reaction previously found by Barge and Bourgain with sera from patients suffering from tuberculosis. This reaction is produced by the injection of fresh active patient serum around the lymphatic glands of guinea pigs infected with tuberculosis. Barge and Bourgain consider the formation of a rash in the lymphatic region 8 to 12 hours after the injection to be a positive reaction. The intensity of the reaction is indicated as from 1 to 4 plus.

The original investigators contend that the reaction is positive in patients suffering from tuberculous infections, and they believe the reaction to be of direct diagnostic significance in tuberculous epididymitis, adenitis, and abscesses.

As an explanation of the reaction, Barge and Bourgain assume the escape of various products or toxins from the tuberculous process into the blood stream. They assert that the reaction these products are capable of bringing about in guinea pigs is not identical with the tuberculin reaction, inasmuch as the Barge-Bourgain reaction may sometimes be positive and may at other times be negative in one and the same patient, depending upon the stage of the tuberculous process. If the process is in the healing stage or so encapsulated as to inhibit the escape of such products into the blood stream, the reaction would be negative, or if the tuberculous process is giving off the products in question which are then liable to enter the circulatory system, a positive reaction would be expected. If the reaction is positive, the authors consider the disease to be in a labile stage and they believe that a tuberculous patient ought not to be operated on as long as the Barge-Bourgain reaction is 2 plus or stronger. This con-

clusion is made concerning, above all, genitourinary tuberculosis.

The authors examined the sera of 19 different patients with pulmonary tuberculosis, all of whom had been hospitalized on the preceding day on account of deterioration in their tuberculous condition. Sera from 9 of these patients gave a Barge-Bourgain reaction of 3 plus, 4 others gave a plus reaction, 3 were negative, and in 3 cases the control-examined animal exhibited local reddening, for which reason the reaction could not be evaluated. The negative cases were patients with recently diagnosed tuberculosis with short histories.

The authors carried out a number of experiments to try to determine the specificity of the reaction, and his examinations show that it is possible, with the use of material containing the decomposed substances of tuberculosis bacteria, to obtain a reaction similar to that shown by Barge and Bourgain in guinea pigs infected with tuberculosis and injected with serum from tuberculous patients. In these experiments the authors used substrates on which tuberculosis cultures had been grown and tuberculosis cultures which had been carefully pounded. Living tuberculosis cultures suspended in physiological salt solution will not produce such a reaction in the animal. No evidence was produced to show that it was the same substance that appears in the serum of some patients when the guinea pig tests are positive, in Barge and Bourgain's conception of the term. It could, however, be stated that the reactions in both cases exhibit similar pictures and that it is not incredible that the two substances are identical. If such is the case, this must be accepted as a sign that Barge and Bourgain's reaction really is a specific reaction.

CLINICAL EXPERIENCE WITH BARGE-BOURGAIN'S REACTION

Berglin examined material consisting of 111 cases, among which there were 17 cases of nontuberculous disease of the urogenital system and 25 cases of other nontuberculous diseases; the remainder were tuberculous.

Of 60 patients with clearly diagnosed tuberculous diseases, a negative test was observed in 23 cases, or 38 per cent. Of the 41 patients who primarily reacted positively, 34 were clearly tuberculous from the beginning or were later found to be so. Six cases, 5 of which were epididymitis and 1 aseptic pyuria, had been strongly suspected of tuberculosis clinically. In only 1 of the 41 cases with a positive Barge-Bourgain reaction was tuberculosis really doubtful. This case was one of the very first, and had been recorded as weakly positive, so it is possible that the reaction may not have been positive. The Barge-Bourgain reaction in all of the 17 controls, consisting of nontuberculous cases of urinary tract infection, were negative. Likewise, the 23 judgeable controls consisting of nonurogenital cases were clearly negative.

On the basis of these findings the author considers that the examinations argue for Barge-Bourgain's contention that the reaction is specific from a diagnostic point of view. It must be pointed out, however, that only a positive reaction is of diagnostic value.

The reaction was of special value in the early diagnosis of obscure cases of tuberculosis of the urinary tract. In a number of cases of renal tuberculosis the reaction was immediately suggestive of a specific diagnosis which could not be confirmed by the bacterial examination until much later.

The possible value of the test in determination of the developmental phase and possible activity of tuberculous infection was indicated in the study when 14 of 15 cases of primary (positive) urogenital disease showed signs of activity or revealed activity in the later course of the disease.

The 13 cases of pulmonary tuberculosis with positive reaction were all in a clinically active stage. The 2 cases located elsewhere were both in an active stage. Thus, of 30 primarily positive cases there was but one case that did not show any signs of activity. These findings warrant the following conclusions:

If the Barge-Bourgain reaction is positive, a tuberculous process in the active state is strongly indicated.

The value of the reaction as an indicator of the activity of a tuberculous infection was conspicuous in those cases in which a positive Barge-Bourgain reaction was not accompanied by clinical signs of activity, but in which the later course of the disease revealed a distinct activity of the process.

In contradistinction, a negative reaction does not exclude the existence of an active tuberculous process.

As an indicator of the activity, the Barge-Bourgain reaction is expected to be of greatest importance from a surgical point of view. By operating during the most favorable phase of the disease a direct spread of the process may be avoided. In the author's experience, and that of others, the patient should not be operated on as long as the reaction is positive. Follow-up examinations of these cases revealed that the reaction became negative much more rapidly on patients who were hospitalized than on those who had been released with a positive reaction. The authors believe that patients in whom the reaction is positive and in whom the disease is, in all probability, in the active stage, should be considered acutely ill and therefore confined to bed.

The authors' findings corroborate those of previous workers and furnish some valuable clinical information on a reaction which will, in all probability, become of great significance in the diagnosis as well as in the treatment of tuberculosis.

ROBERT O. BEADLES M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Paralytic Equinovarus Deformities of the Foot. J. LEONARD GOLDNER and C. E. IRWIN. *South. M. J.*, 1949, 42: 83.

The authors herein discuss two types of feet, both of which are classed as paralytic equinovarus deformities: (1) equinovarus foot with contracted Achilles tendon, cavus, contracted plantar fascia, depressed first metatarsal head, and claw toes, and (2) the rigid recurrent equinovarus foot.

Abnormal physiology and etiology are discussed in an orderly and lucid manner. Some of the points made are that muscle imbalance predisposes to fixed deformity. Contracture of the plantar fascia ensues. Relaxed subastragalar and midtarsal joints magnify the deformity. Abnormal distribution of body weight increases the varus once it is present.

A standard method of recording the functional strength of muscles is described. This together with analysis of bone age and architecture of the foot is a prerequisite to treatment.

Nonsurgical measures are outlined for children under 9 years of age, who are still in the period when muscle strength is returning or who are too young for surgery. Lengthening of the Achilles tendon may be required occasionally. Tendon transplants alone, without stabilization, are usually not indicated. The importance of the posterior tibial muscle has frequently been overlooked.

Operative treatment of patients more than 9 years of age is designed to (1) stabilize and align the foot, (2) remove deforming factors, (3) eliminate joint pains, calluses, and limp, (4) obviate leg braces, and (5) restore normalcy in appearance.

Surgical procedures for adults include:

1. Plantar fasciotomy.
2. Triple arthrodesis (after the method of Hoke, in such a way that the dorsum of the foot is shortened in ratio to the strength of the extensor muscles, the plantar surface is elongated, and the varus of the forefoot and heel is corrected).
3. Wedging of the forefoot upward after from 7 to 10 days.
4. Tendon surgery 4 weeks after stabilization.
5. Correction of external torsion of the tibia by a high greenstick rotation osteotomy at the same time the tendon work is done.

In the case of the rigid recurrent equinovarus, the surgery is as indicated for relapsed clubfoot.

Charts showing combinations and procedures applicable in performing tendon transplants after arthrodesis are submitted in concluding this article. The drawing and the photographs are excellent and further serve to illustrate the well written text.

KENNETH E. SHERMAN, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Surgical Treatment of Osteoarticular Tuberculosis (Tratamiento quirúrgico de la tuberculosis osteoarticular). ALBERTO INCLÁN, JR. *Cir. ortop. traumat.*, Habana, 1948, 14: 75.

Forty-three cases of bone or joint tuberculosis treated surgically are reviewed by the author. Among the recent additions to the surgical armamentarium in the treatment of this disease the author mentions the following: the use of the Haynes splint for immobilization of the knee joint following arthrodesis, the use of streptomycin after excision of the diseased tissue in 3 cases of tenosynovitis, and the employment of the Brittain technique for extra-articular arthrodesis of the hip and shoulder.

Articular resection is employed now only in exceptional cases, such as tuberculosis of the elbow in adults, certain lesions of the wrist, and certain types of hip disease.

The introduction of antibiotics which are able to control secondary infections has limited the indications for amputation greatly. As a rule, arthrodesis constitutes the method of choice in the treatment of osteoarticular tuberculosis. The effect of this operation may be compared with that of thoracoplasty in the treatment of pulmonary tuberculosis, i.e., it provides immobilization of the involved region.

Extra-articular arthrodesis is preferable to the intra-articular type in the treatment of articular tuberculosis because it avoids entering the articular capsule and reactivating or disseminating the specific infection.

Tuberculous abscesses should be treated by repeated aspiration and not by incision and drainage. Only Pott's abscess, which produces compression of the spinal cord, may require drainage. Another exception is the retropharyngeal abscess which should be drained if it causes dyspnea or dysphagia.

Of 205 cases of osteoarticular tuberculosis, 43 have been treated surgically, among them being 15 cases of Pott's disease and 17 cases of disease of the hip.

JOSEPH K. NARAT, M.D.

Delayed Autogenous Bone Graft in the Treatment of Congenital Pseudarthrosis. JOHN ROYAL MOORE. *J. Bone Surg.*, 1949, 31-A: 23.

A discussion of the theories of the etiology of congenital pseudarthrosis and of various methods of treatment is presented. The histopathological characteristics of the lesion have been generally accepted as conforming to those of acquired pseudarthrosis. Inert, sclerosed, pointed, atrophic bone ends surrounded by a sleeve of dense connective tissue and developing ultimately the characteristics of a near-arthrosis including the cartilage and joint cavity are the principal findings in the mobile type. The author

theorizes that the end product of osteogenesis (laminated bone) in the pseudarthrosis area is defective in quality, in that it is not only incapable of withstanding the physiological stresses, but is equally incapable of repair.

He classifies the lesion into two principal types: (1) prepseudarthrosis, the stage in which the long bone is bowed or bowing, the apex of the bow is narrow, the medullary cavity becomes obliterated, and spontaneous or induced fracture occurs, followed by pseudarthrosis; and (2) pseudarthrosis, which may be fibrous to frank nearthrosis.

With this hypothesis the delayed autogenous bone graft is presented; it is an excellent means of producing osteogenesis. The delayed graft is one which is completely freed of all attachments at the donor site of the tibia, fibula, or ilium. It is replaced in the original site and the wound closed. In from 18 to 21 days it is carefully removed with its new-bone components and implanted in the fragments comprising the pseudarthrosis.

Careful attention is paid at operation to removal of the pseudarthrosis and preparation of the bed for the graft. For immobilization during operation in tibial sites the author uses the Abbott bone-lengthening apparatus with four steel wires in the tibia and an intramedullary wire in the fibula. The tibial fragments are split to the nearest wire and the tibial bone graft is wedged in. He also recommends grafting the fibula at the same time. He approaches both bones through the anterior compartment through one incision. The wound is closed in layers. Routine light dressings are covered by a plaster cylinder (including pins) which extends from the toes to the groin. In cases in which lengthening is required, the delayed graft must not be started until the lengthening is completed and the operative wound has healed. For a pseudarthrosis of the ulna, femur, or clavicle, delayed onlay grafts are used with secure internal fixation as well as external immobilization.

The pins and plaster are maintained until the medullary cavity appears in the graft, which requires an average of 4 to 6 months. Then, in the case of the tibia, a double-bar caliper brace, extending from the ankle to the groin, is applied. This brace has a pelvic band and a full length tibial leather cuff. This is worn for 2 years. Roentgenograms are taken bimonthly during this period.

Successful osteosynthesis has been accomplished in 8 cases of congenital pseudarthrosis. In 6 cases the deformity was in the leg, and in one case each, in the ulna and femur. In 2 cases, three delayed grafts were required, and in 1 case an additional bone graft was required for reinforcement to prevent possible fracture. In 2 cases spontaneous fracture occurred; and traumatic fracture occurred once in each of 3 cases, which necessitated the extra grafting mentioned previously.

Illustrative roentgenographic reproductions accompany the text. Photomicrographs of immediate and delayed bone graft histology, as well as that of pseudarthroses are shown.

The author concludes that the delayed autogenous bone graft is capable of stimulating osteogenesis. The extra supply of alkaline phosphatase and the attached newly formed bone may contribute to osteogenesis. Bony union has occurred in each instance. The principal problem is one of meticulously nurturing the young bone until it can withstand the physiological forces and, later, the functional demand. Reinforcement of the newly formed tibia at its weak point, as evidenced by narrowing or incipient bowing, is imperative. Continuation of primary immobilization until the medullary cavity if formed is emphasized.

KENATH H. SPONSEL, M.D.

Transfer of a Metacarpal. G. L. HYROOP. *Plast. Reconstr. Surg.*, 1949, 4: 45.

The first transfer of a metacarpal with the attached digit was reported by Bunnell in 1931. This was a transfer of a second metacarpal with partial amputation of the index finger.

The aim in any type of reconstructive surgery is to restore or to improve function, sensation, and cosmetic appearance. Loss of the thumb, for example, with the first metacarpal, produces a serious disability of the hand.

Under special circumstances it may be well to repair the skin, nerves, bones, and tendons before the metacarpal is transplanted to determine the sensation and the amount of function that is to be expected in the digit. If a tendon pulley is required the deficiency should be corrected before transfer of the digit is undertaken. Adductor contractures between the thumb and index fingers and other scarring may have to be repaired. Exposed bone and soft tissues must be covered. Surgery may not be performed for from 6 months to a year following the healing of osteomyelitis. When there is amputation of the thumb, or of the long or ring fingers because of tumor, transfer may be carried out immediately or later, in accordance with the type of lesion present.

A brief discussion of operative technique is included. Indications for the operation with reference to the thumb and also the other fingers are given. Illustrative drawings, photographs of roentgenograms of the hands as well as illustrations of the hands are shown. The article is based upon the author's experience with 34 cases. The advantages of metacarpal transfer are that recovery following surgery is quite rapid, and that the nerve and vascular supply are retained. KENNETH SHERMAN, M.D.

Results of Intertrochanteric Osteotomy in Pseudarthrosis of the Femoral Neck (Risultati di osteotomie intertrocanteriche per pseudoartrosi del collo femorale). G. DE LUCCHI and A. NURRA. *Chir. org. movim.*, 1948, 32: 421.

The authors report on 42 cases treated by intertrochanteric osteotomy at the Istituto Rizzoli of Bologna, Italy, from January 1, 1940 to December 31, 1945. This was performed for nonunion of fractures of the femoral neck.

A stable hip, with some shortening (not exceeding 4 cm.), some limitation of hip motion, with no pain and a perceptible limp is considered a good result.

The authors quote Putti as saying that it is impossible to expect a perfectly functioning articulation following this procedure. They stress that it is important that the thrust force be exerted directly under the head in weight bearing. This frequently results in a solid bony union between the head, the intertrochanteric osteotomy area, and the greater trochanter. In the authors' experience, a not uncommon cause of failure in this procedure has been the inaccurate placing of the femoral shaft under the head.

Immobilization of the osteotomy site for from 5 to 6 months is recommended. A long leg abduction cast is replaced by a short leg abduction cast at the end of 10 or 12 weeks.

In the 42 cases reported the results are evaluated as good (21) fair (7), and bad (8). The remaining 6 cases did not have adequate follow-up.

The Pauwel classification of hip fractures is discussed.

CARLO SCUDERI, M.D.

Arthroplasty of the Knee Joint. J. EDOUARD SAMSON. *J. Bone Surg.*, 1949, 31-B: 50.

The author bases his findings on 72 patients who were operated on between 1924 and 1941. In 4 of these patients an arthroplasty was performed in both knees. The femoral and tibial condyles were removed freely. A central ridge was left on the tibial plateau to correspond with the intercondylar notch of the femur. A free fascial flap measuring 15 by 10 cm. was used to cover the bony surfaces.

Early motion was encouraged. The author infiltrated the knee joint with novocain to enable his patients to move the knee freely. Bilateral arthroplasty of the knee was discarded because it was found that the development of a second knee nearthrosis was usually beyond the capacity of the patient. The lower age limit was set at 20 years. In 52 per cent of the author's patients a stable and painless joint was obtained. Poor results were found in 48 per cent.

GEORGE I. REISS, M.D.

Arthroplasty of the Knee. J. S. SPEED and PHILIP C. TROUT. *J. Bone Surg.*, 1949, 31-B: 53.

The residual effects of acute infective arthritis of hematogenous origin, of suppurative arthritis of external origin, and the results of incomplete painful ankylosis or complete ankylosis of the knee joint were found to be the only indication for arthroplasty. Multiple rheumatoid arthritis, tuberculosis, osteomyelitis, obesity and osteoporosis were considered as contraindications for arthroplasty of the knee joint.

The operation consisted of building a simple type of hinge joint. The extensor apparatus was not disturbed. A sufficient amount of bone was removed from the posterior femoral condyles to allow the tibia to slide into the popliteal space. If only one-half of the knee joint was ankylosed no arthroplasty was performed because it failed in all instances. It was found that fascial covering of the condyle was not necessary but that it helped until fibrocartilage was formed. The cruciate ligaments had to be sacrificed.

The most sufficient range of motion was between 180 and 110 degrees. Motion beyond the 90 degree angle may produce instability. Pain was observed in a few patients. The author stated that in 45 per cent of the cases the results were classified as good and in 20 per cent they were failures.

Watson Jones opposed arthroplasty of the knee because he felt that the patient could not depend upon his knee. He stated that an arthrodesis was not too great a handicap and that arthroplasty was indicated only if there was ankylosis of both knees or of the hip and knee of the same side. Freiberg presented a patient operated on in 1935 who had a very good result. Cleveland pointed out that the author reported only one-third of all the knee joints operated on and discarded two-thirds because of various reasons. Less than 50 per cent of the patients were classified as having a good result. He pointed out that this left a very small number of good results and advocated extreme caution in the selection of cases for arthroplasty.

GEORGE I. REISS, M.D.

On Arthrodesis of the Ankle Joint in Posttraumatic Conditions. A. KARLÉN. *Acta orthop. scand.*, 1948, 18: 175.

The author reports the results of 24 cases of tibiotarsal arthrodesis for post-traumatic conditions. Bony ankylosis was obtained in all cases. Twenty-one patients are fully able to work, 2 are doing light work, and 1 is still under treatment (supplementary subastragalar arthrodesis). Three patients have secondary osteoarthritis of the neighboring joints.

These procedures were performed during the period from 1936 to 1946 at the Orthopedic Clinic of the Karolinska Institute in Stockholm. The majority of operations were performed for fractures of both malleoli or for trimalleolar fractures. Exclusive intra-articular arthrodesis has been practiced as the earliest operative procedure. Gradually, insertion of one, and later of two transarticular bone grafts completed the surgical interference.

When all reported cases are considered, the argument that ankylosis of the talocrural joint is difficult to obtain seems to be refuted by the average duration of the ankylosing phase, amounting to 3.1 months. Fusion occurred most readily after intra-articular arthrodesis combined with fixation of two grafts across the articulation.

Immobilization of the ankle joint imposes increased strain, particularly on Chopart's joint. Evidence of this condition is given by an increased range of movement (to 30 degrees) that subsequently appears in that joint. Also the subtaloid joints may be considered as being exposed to increased, abnormal strain which is due either to a decreased rate of pronation and supination, or, at least, to a certain elasticity in the ankle joint. Secondary

arthrosis deformans involving the exposed joints may be expected and referable to these increased strains.

In order to avoid such discomfort the author advocated a panastragalar arthrodesis and this procedure was carried out in 10 cases. No pain arose from the midfoot postoperatively in 8 of these cases. Hallgrimson has reported on 15 cases of poliomyelitis which were followed up after panastragalar arthrodesis. In 6 of them, there was a more or less increased range of movement in Lisfranc's joint; this movement, however, never exceeded 20 degrees. Two patients complained of subsequent slight pain.

Nevertheless, the author did not think that panastragalar arthrodesis should become a generally used procedure in preference to talocrural fusion because of the greater duration of the operative procedure in the injuries sustained by the soft tissues, necrosis of the skin, etc. Tibiotarsal arthrodesis combined initially with subastragalar (tri-articular) arthrodesis is confined to cases which have already (before operation) developed osteoarthritis in the subastragalar and midtarsal joints.

C. Fred Goeringer, M.D.

FRACTURES AND DISLOCATIONS

Avascular Necrosis of Large Segmental Fracture Fragments of the Long Bones. Edward L. Compere. *J. Bone Surg.*, 1949, 31-A: 47.

Five cases are presented in detail in which there was avascular necrosis of large segmental fracture fragments of the long bones. In these cases it may be predicted that there will be a marked delay in union of the large segmental fracture of the midshaft or ends of a major long bone. The larger the fragment, the poorer the prognosis, from the standpoint of viability of that fragment. If most of the cells die in the fragment it will become necrotic, although massive sequestration does not occur. Union may be delayed for many months. With good fixation, healing of the fracture will take place. If the nutrient artery remains uninjured, aseptic necrosis may not occur. Richard J. Bennett, Jr., M.D.

Traumatic Posterior (Retroglenoid) Dislocation of the Humerus. John C. Wilson and Francis M. McKeever. *J. Bone Surg.*, 1949, 31-A: 160.

Posterior dislocation of the humeral head is relatively uncommon, but it is also frequently unrecognized until weeks after its occurrence when treatment is difficult and the prognosis uncertain.

Eleven males, presenting a total of 12 posteriorly dislocated shoulders, were studied. Four dislocations, including the bilateral ones, resulted from epileptic convulsions, and the rest from violent external trauma.

Concomitant fracture of varying degrees occurred in 8 of the shoulders and contributed to failure of early diagnosis of the dislocation in more than half of the cases.

Review of the pathological findings in the patients operated upon shows that the type and extent of damage depends upon the degree of violence producing the original dislocation. Nerve damage is rarely encountered. Clinical recognition of the posterior dislocation is easy before swelling obliterates the landmarks and in old untreated cases. Adequate roentgenograms are imperative, especially lateral views, which can be interpreted without unusual difficulty.

In the first hours after injury, reduction is readily accomplished under anesthesia, but it is not easily maintained. The necessary position of marked internal rotation is most uncomfortable for a period of time. In 3 dislocations, the reduction was safely and comfortably held by fixing the head to the acromion process with cruciate wires. These may be inserted and then removed after 3 weeks without open operation. Only a sling is needed for support, and the early motion that is possible allows good recovery of function.

The results of late treatment are poor because of gross joint changes and fibrosis.

Frances E. Brennecke, M.D.

Indication for Operative Treatment of Fractures of the Proximal Portion of the Upper Arm (Zur Indikation der operativen Behandlung von Frakturen im koerpernahen Abschnitt des Oberarmes). Hermann Karcher. *Chirurg*, 1948, 19: 553.

Conservative treatment of fractures of the proximal portion of the upper arm is advocated by the author because it furnishes good functional results. In dislocation fractures an operative treatment is indicated only if (in exceptional cases) conservative measures fail.

The author is not in favor of operative procedures because:

1. There is no danger of pseudarthrosis in this region.
2. An open reduction inhibits callus formation, delays consolidation, and frequently irritates the articular capsule.
3. The open articular capsule is easily subject to infection and the proximity of the nail to the articulation frequently causes effusions.
4. The hospitalization period is not shortened but rather prolonged after an open reduction; furthermore, a readmission is necessary for removal of the nail.
5. Periodic examinations show that the results of open reduction are poorer than those of conservative treatment.

An impacted fracture of the surgical neck is immobilized in a sling or by a Desault dressing.

A thoracic abduction cast is applied in case of a nonimpacted fracture, with good apposition of the fragments.

Malposition of the fragments is corrected by closed reduction under local or general anesthesia. If the reduction is unsuccessful, a wire extension is applied.

The same method is employed in the treatment of subcapital fractures and dislocations.

JOSEPH K. NARAT, M.D.

Follow-Up Results of Surgical Treatment for Nonunion of the Carpal Scaphoid Bone: Report of 19 Cases. C. FRED GOERINGER. *Arch. Surg.*, 1949, 58: 291.

Twenty operations were performed on 19 patients with nonunion of the carpal scaphoid. The bone graft was taken from the tibia. One case of nonunion persisted following the bone grafting.

In 8 of the 16 cases supplementary drilling was carried out, and it is believed that the follow-up indicates that this procedure would be of value in selected cases. A large chart is included giving voluminous details about each case. Six roentgenograms are included.

In 2 instances the proximal fragment was removed, and in 1 instance, the distal fragment. These patients are said to have pain and limitation of motion in the wrist postoperatively.

The author suggests that arthrodesis of the wrist is preferable to excision of one or more of the carpal bones.

RICHARD J. BENNETT, JR., M.D.

Management of Intracapsular Hip Fractures. ROBERT T. MCELVENNY. *Surg. Clin. N. America*, 1949, 29: 31.

The author states that an intracapsular fracture of a femoral neck in an elderly patient is no surgical emergency but may well be a medical emergency. The patient is put to bed with boards under the mattress and 5 pounds of Russell traction. Proper padding is placed beneath the buttocks and above the rubber sheet. The patient is encouraged to use the hand attachments of the overhead frame, and to sit up and move about. He is turned from side to side frequently. Small doses of morphine, codeine, and aspirin may be prescribed. A complete medical survey is made, and surgery is postponed until medical balance is obtained, which averages from 7 to 10 days. The patient is typed for transfusion. Postoperatively the patient is again placed in moderate traction and only one hypodermic of 1/12 grain of morphine is given. Thereafter codeine by hypodermic injection or codeine and aspirin are given orally for pain. Penicillin is given routinely. Deep breathing exercises are given, but the patient is not out of bed for from 10 to 21 days. Meanwhile exercises of the extremities are encouraged. The patient is then placed in a wheel chair, and later is taught to use crutches, but weight-bearing is not permitted until 4 to 6 months postoperatively.

The operative procedure as described by the author takes from 1 to 2 hours. He prefers anesthesia by pentothal induction followed by the inhalation of 50 per cent nitrous oxide and 50 per cent oxygen, sometimes supplemented by small additional injections of pentothal. After anesthesia the patient is placed upon the casette holder with a narrow perineal post. Traction is applied to both extremities. The reduction is accomplished and checked with anteroposterior and lateral views. No surgical preparation or draping is done until completely satisfactory reduction is shown by adequate roentgenograms in both planes. Routine exposure and insertion of the guide wire through a quarter inch drill hole is described. Placement and depth are checked with roentgenograms and the length of the cannulated nail is determined. A starter is used and then the nail is driven in. Roentgenograms in both planes check the position of the nail.

The author attempts to differentiate between aseptic necrosis, a rare complication in his series, and delayed union, a common complication. Following 65 hip operations for fracture there were 11 failures (16.78%). The failures consisted of 1 case of aseptic necrosis, 2 cases of nonunion, 2 of nonreduction (immediate osteotomy), 5 of delayed union, and 1 death. There were no serious infections. The excellent results obtained were attributed to the efficient reduction, so that the roentgenograms in both planes showed the neck fragment under and medial to the head fragment in a true valgus position.

DANIEL H. LEVINTHAL, M.D.

Comminuted and Segmental Fractures of the Leg. KELLOGG SPEED. *Surg. Clin. N. America*, 1949, 29: 1.

Comminuted fracture of the leg, simple or compound, often presents problems not successfully treated by any uniform routine method; however, the purposes of treatment should be carefully noted: (1) restoration of limb length, (2) restoration of the axial relationship of the knee and ankle, (3) maintenance of the integrity of the soft parts by gentle handling and consideration of the nerves and vessels, and (4) maintenance of reduction until adequate callus can hold the fragments.

An injured leg should be splinted and the patient put at rest. The circulatory status of the limb should be noted, as well as muscle function. X-ray study of the limb in anteroposterior and lateral views should be made. With careful handling of the leg the tissue should be prepared with a soap and water scrub, any open wounds being covered with sterile sponge. Hair should be shaved off. Then the preparation is continued with 70 per cent alcohol and a dye antiseptic if desired. The surgeon may elect the closed or open method of treatment, according to the circumstances of the injury, the type of fracture, and his operative experience and training. The fracture dislocation is reduced on the fracture table by fixed or manual traction, and the leg is securely encased in a padded plaster cast from the upper thigh to the toes. The cast may be incompletely bivalved in anticipation of swelling, and the limb is elevated on pillows. In some cases continuous traction is preferred by means of insertion of a Steinmann pin through the calcaneus and suspension of the limb in balanced traction, with the Thomas splint. Distraction is to be avoided by x-ray follow-up. Transfixion pins and outside bars are not a generally accepted method of treatment.

A satisfactory method of treatment is the use of the Steinmann pin through the calcaneus for traction in reduction; then another pin is placed transversely through the tibial tubercle and the whole limb is encased in plaster for about 8 to 12 weeks. It is then removed and followed by a walking boot cast, if healing has been satisfactory and sufficient callus and bone are noted in the roentgenogram. The use of the walking iron stirrup, unless carefully planned, is dangerous. DANIEL H. LEVINTHAL, M.D.

Treatment of Malleolar Fractures According to Lauge Hansen's Method. Preliminary Results. T. BAEK KRISTENSEN. *Acta chir. scand.*, 1949, 97: 362.

On the basis of 200 cases of ankle fracture treated according to Lauge Hansen's method, the system of classification, manners of production, and mechanisms of reduction are reviewed.

Supination-eversion fractures. The supinated foot is everted, i.e., the tip of the foot is turned outward around a vertical axis. The characteristic feature of this type is the oblique spiral fracture involving the lateral malleolus and the adjacent part of the fibula.

Supination-adduction fractures. The foot is supinated and adducted at the talocrural joint, thereby causing an avulsion fracture of the lateral malleolus (or lesion of the ligamentum calcaneofibulare). The characteristic feature of this type of fracture is the transverse fracture of the lateral malleolus on a level with, or distal to, the articular surface of the ankle joint.

Pronation-eversion fractures. When the foot is pronated, the deltoid ligament is tightened. The characteristic feature of this type of fracture is the high fracture of the fibula.

Pronation-abduction fractures. When the foot is maximally pronated, the deltoid ligament is tightened. The characteristic feature of this type of fracture is the bending fracture of the fibula at a point a little above the ankle joint.

Pronation-dorsiflexion fractures. By forced dorsiflexion of the pronated foot, pressure is exerted by the talus on the tibia and medial malleolus. The characteristic feature of this type of fracture is the large fracture of the anterior lip of the tibia.

The material reported here comprises all the cases of ankle fracture treated in the Surgical Department from November 1, 1942 to November 1, 1946. The follow-up examination took place at least 12 months after the accident. Among 200 patients, there were 116 men and 84 women, a distribution roughly corresponding to that found in other reports. Cases of epiphyseal separation have not been included.

In 120 of the 200 patients studied, it was necessary to reduce the fractures; 115 were reduced at once. In 106 cases the result was good, in 8 the result was fair, and in 1 case the result was poor. Open reduction, osteosynthesis, and wire extension were not employed. If the control roentgenograms showed good position, a rubber-covered wooden block, serving as a heel, was incorporated 2 or 3 days later, and usually the patients were allowed to get out of bed and were discharged after another couple of days. The time in bed after the application of the plaster cast averaged 4.2 days for patients with uncomplicated fractures.

In the classification and end results, the author adopted various criteria which seemed to be acceptable. An analysis of the causes of the poor results was made in the various types of fractures. The pronation-abduction fractures have given the greatest percentage of poor results, whereas no poor results were found among the supination-abduction fractures subjected to follow-up examination.

C. FRED GOERINGER, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Arterial Injuries. An Analysis of the Immediate and Late Results of Arterial Injury Based on Military Experience. CLARENCE E. GARDNER, JR. *Am. J. Surg.*, 1949, 77: 181.

The author states that acute arterial wounds were found in 5.4 per cent of the leg and arm wounds in fresh Air Corps battle casualties. Arterial spasm, contusion, and laceration are discussed, and cases illustrative of each condition are reported in detail. Severe arterial spasm must be relieved in 6 hours if the complications of ischemia are to be avoided. Sympathetic block, brachial plexus block, and spinal anesthesia may be helpful. Periarterial injection of novocain, massage, and lavage of the affected vessel with warm solutions were not effective in relieving spasm.

Complete division is recommended whenever ligation is performed. Concomitant vein ligation was practiced in all cases.

Arterial suture is stated to be the best method of restoring the circulation in lacerations which do not involve the entire circumference of the vessel, and in those cases of complete severance in which there has not been too much loss of substance. Suture was performed in 5 cases; in 2 it was done upon the popliteal artery. All of these sutures plus one arterial suture upon the femoral artery were unsuccessful although gangrene did not occur in the instance in which the suture was applied to the femoral artery. The nonsuture vein graft technique described by Blakemore was used unsuccessfully in 1 case. Heparin was not used in any of the author's cases although its use is advocated in vascular injuries of civilian practice. For the ischemic extremity sympathetic blocks are recommended with reblocking at 4 to 8 hour intervals. Refrigeration of the ischemic limb is believed to be applicable only in the cases in which toxic absorption prior to amputation is a factor. Cooling by means of exposure to room temperature or by permitting fans to blow over wet cloths is thought to be worthwhile. The author cautions against the application of heat and recommends complete rest of the ischemic limb in a position of slight dependency.

A delay of 3 months before operative intervention is undertaken is advised in the cases of hematomas which are not increasing in size. Immediate operation may be necessary in cases in which they are enlarging.

The ideal method of treatment of arteriovenous aneurysm is believed to be quadruple ligation and excision. For secondary hemorrhage from arterial injuries the author believes that opening of the original wound with ligation and division of the bleeding vessel is the only method of control.

ALLAN D. CALLOW, M.D.

Investigation and Treatment of Arterial Disturbances in the Lower Limbs, CLIFFORD JONES and R. E. STEINER. *Brit. J. Surg.*, 1949, 36: 286.

This article is largely devoted to a description of the technique of arteriography and to a discussion of the authors' findings in 46 cases.

The technique does not aid materially in the differential diagnosis of peripheral vascular disease but it does help to localize the diseased area more specifically, particularly in arteriosclerosis.

The authors have based the therapy on their roentgenologic findings using sympathectomy to produce vasodilatation and arteriectomy to remove an irritant focus in the vessel if one is demonstrated. The effect of treatment cannot be evaluated, and the effect of either procedure alone is not controlled.

JOHN H. KAY, M.D.

Postphlebitic Sequelae. ALTON OCHSNER and MICHAEL DEBAKEY. *J. Am. M. Ass.*, 1949, 139: 423.

Thrombophlebitis is an inflammation of the vein wall due either to bacterial invasion or toxins brought to the wall by the perivenous lymphatics. The thrombus that results is firmly attached to the wall and there is little possibility of its detaching and forming an embolus. However, an embolus may occur secondary to a suppurative phlebitis and treatment consists of ligation proximal to the involved segment of vein. In phlebothrombosis a nonadherent clot is formed by increased blood coagulability and circulatory stasis, and the danger of embolism is great.

Although thrombophlebitis is rarely complicated by embolism, in most cases persistent, annoying, uncomfortable, and disabling sequelae develop unless adequate therapy is instituted during the acute phase of the venous lesion. Persistent postphlebitic sequelae consist of edema, ulceration, and recurrent streptococcus infections. The edema during the acute phase of thrombophlebitis is due to vasospasm with resulting relative anoxia of the capillary endothelium and exudation into the perivascular spaces. Vasospasm is also a factor in persistent postphlebitic edema.

The treatment of postphlebitic edema due to vasospasm may be either conservative or radical.

The former consists of avoidance of those measures which produce vasoconstriction, such as smoking, exposure to cold, and emotional upset. An elastic bandage from toe to knee should be worn all day. Radical treatment consists of sympathectomy.

The patients who are not benefited by vasodilatation have another factor causing the edema. This factor may be either incompetency of the valves of the deep veins or obliteration of the vein with its embedment in dense perivenous scar tissue. Phlebograms will differentiate between the two types of lesions.

Incompetency of the valves is treated by exposure of the deep veins in Hunter's canal and ligation of the superficial femoral vein. Perivenous cicatrization is treated by removing the fibrous tissue mantle from about the vein. Ulceration is treated by sympathectomy with ligation of the superficial femoral vein and subfascial ligation of the communicating veins.

Recurrent streptococcic infections are avoided by careful hygienic care of the legs and feet. Acute attacks are treated by immediate rest in bed and prompt institution of antibiotic therapy.

ELY ELLIOTT LAZARUS, M.D.

Tissue-Culture Evaluation of the Viability of Blood Vessels Stored by Refrigeration. E. CONVERSE PEIRCE, II, ROBERT E. GROSS, ALEXANDER H. BILL, JR., and KEITH MERRILL, JR. *Ann. Surg.*, 1949, 129: 333.

After the authors had studied various methods of preservation they used tissue culture techniques to demonstrate viability of the blood vessels, and concluded that storage of the vessels in the 10 per cent homologous serum and balanced salt solution (Ringer's solution) at temperatures slightly above freezing gave uniformly viable vessels. Of six methods studied, this was the most successful, the frozen vessels showing growth on tissue culture in only 2 of 34 experiments. Small pieces of tissue stored alone gave poor results, but their viability could be maintained by adding a large piece of tissue to the substrate.

The authors report that vessels so stored have been safely used in dogs and humans for homoplastic grafts.

JOHN H. KAY, M.D.

BLOOD; TRANSFUSION

The Rh Blood Groups and Their Clinical Effects. P. L. MOLLISON, A. E. MOURANT, and R. R. RACE. *Med. Res. Council*, Lond., 1948, No. 19.

In England the Medical Research Council, realizing that there is an urgent need for an authoritative summary of the present knowledge on the subject of the Rh blood groups and their clinical effects, has prepared a most welcome memorandum on this subject. It seems inevitable that a discovery which is so intellectually satisfying and so practically effective should, of course, gather around it a very bulky literature and one that seems to grow as the research in this field progresses.

First of all the division and classification of the Rh groups are discussed. Second, the clinical considerations and importance of the Rh groups, and, third, Rh testing are discussed.

The discovery of the Rh factor in human blood and the recognition that human beings can be classified both as Rh-positive and Rh-negative, according to whether or not their blood cells are agglutinated by anti-Rh serum, led to the solution of two problems that had long disturbed clinicians and hematologists. These were the diseases now called hemolytic disease of the newborn, and the many hemolytic reactions that occasionally followed blood transfusions even when a reliable and compatible blood type was used.

The brilliant discoveries by Levine and Stetson in 1939 of an atypical immune agglutinin in the serum of a woman after a stillbirth was the first of a series of rapid developments which led up to the present concept of the Rh blood groups and their clinical manifestations. In 1940 Landsteiner and Wiener reported finding the Rh antigen. Most important research investigations were actively pursued by Taylor, Mollison, Race, Wiener, and Fisher.

It soon became apparent that Rh testing should be made a routine before the administration of any type of blood. Even now, however, there is a tendency to ignore the need for such tests and it is necessary to emphasize the two main dangers that can be avoided by using the Rh test. First, the giving of Rh-positive blood to Rh-negative persons who have been sensitized by either a pregnancy or a previous blood transfusion may kill them. Second, the giving of Rh-positive blood to an Rh-negative woman may sensitize her to the Rh antigen, so that any Rh-positive child subsequently born to her may be seriously diseased or even stillborn. The injection of even a small amount of Rh-positive blood may be enough to cause life-long sensitization.

In discussing the clinical considerations the authors mention that many tragedies could be prevented by routine Rh testing and by never giving Rh-positive blood to an Rh-negative patient. By this simple measure alone it has been estimated that about 20 or 25 per cent of all cases of hemolytic disease could be prevented, as well as a large number of fatal transfusion reactions. The direct matching of the donor's and the recipient's blood is a very valuable safeguard against fatal transfusion reactions from Rh as well as from the blood type incompatibility, but it is no safeguard at all against the possibility that a transfusion may initiate Rh sensitization and thus lead to a future case of hemolytic disease. Therefore, in circumstances under which Rh testing cannot be performed, all females who have not passed the child-bearing age should certainly receive Rh-negative blood if this can be obtained.

Rh testing during pregnancy is desirable, but it has not at present the same importance as Rh testing before transfusion, since no means of preventing sensitization of an Rh-negative mother by an Rh-positive fetus are known.

The present state of our knowledge of the Rh blood groups and their clinical effects have been completely summarized in this excellent monograph.

EDWARD F. LEWISON, M.D.

Hemophilia. A Clinical Study of 40 Patients. CHARLES S. DAVIDSON, ROBERT D. EPSTEIN, GEORGE F. MILLER, and F. H. L. TAYLOR. *Blood*, 1949, 4: 97.

Hemophilia is an hereditary disease limited to males, in whom there is both an impaired coagula-

bility of the blood and a strong tendency to bleed, especially following trauma. It is always present for life. Transmission is always through the female to the second generation, the genes being sex-linked and recessive. The coagulation defect is observed in vitro as a prolongation of the whole blood clotting time from a normal of 6 to 12 minutes to many hours. Most of the patients in the authors' series have clotting times of 1 to 2 hours. It is generally agreed that the fibrinogen, prothrombin, calcium, and the *number* of platelets are all normal.

The authors report the cases of 40 patients aged 12 years or over who have been followed during the last 10 years. All were males. Seventy per cent of these had a family history of hemophilia. There were 5 deaths; 3 were caused by conditions unrelated to hemophilia, and none occurred as the result of acute hemorrhage. Bleeding into joints is the most frequent hemorrhagic episode of adult hemophiliacs. It is recurrent, so that eventually many joints acquire some degree of permanent damage, the knees and elbows being most frequently involved. In only 2 of the series was there no evidence of *chronic* hemophilic arthritis, and the authors state that one would hesitate to make the diagnosis of hemophilia without the presence of joint deformity unless the diagnosis could be otherwise conclusively established. Purpura is not the characteristic finding here that it is in purpura hemorrhagica. Bleeding into muscle almost always follows severe trauma and may spread so dangerously as to result in shock. Attacks of hematuria are one of the most frequent hemorrhagic episodes, almost 90 per cent of this series having suffered one or more such episodes. Hematuria may be painless unless clots are passed. It may last a day or so, or may be prolonged for several weeks, no known factor or form of treatment apparently affecting the duration. Other less common bleeding phenomena are hemophilic pseudo bone tumor, pharyngeal hematomas, pulmonary and pleural bleeding episodes, and the abdominal and retroperitoneal bleeding episodes which may mimic acute surgical conditions of the abdomen. Intracranial hemorrhage is rare.

Transfusions of whole fresh blood or plasma separated soon after phlebotomy are effective in correcting the coagulation defect, although bleeding may continue in spite of the coagulation time having been brought to normal. Whole blood may be given in amounts necessary to replace that lost or, if blood is not necessary, plasma in amounts of 100 to 250 c.c. may be given. The correction of the coagulation time may persist for 6 to 12 hours. Thus, for continued bleeding, blood or its derivatives should be given once or twice daily during the period of active bleeding. Blood plasma fractionation has led to the production of Fraction I, a preparation of human fibrinogen which contains antihemophilic properties and which can be conveniently and quickly given. Its limitations are its production in limited amounts and the probable transmission of hepatitis, which occurred in 2 cases in this series.

For local bleeding, thrombin (held in place with some form of pressure dressing) is preferred as a coagulant. Major surgery is hazardous and the estimate of Friedrich of a mortality of 35 per cent is probably conservative. Free use of preoperative and postoperative blood transfusions and thrombin, wherever possible, are the only important additions to a careful surgical technique. A detailed plan of treatment for the many types of bleeding disabilities to which hemophiliacs are heir is presented, with emphasis upon the suitable management of dental extractions and dental hygiene.

The authors conclude with the statement that the physician must not slight the social, economic, and psychiatric implications of the disease in his efforts to aid the patient to learn to live with his disease.

ALLAN D. CALLOW, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE, POSTOPERATIVE TREATMENT

Blood Supply of Cross Leg Pedicle Flaps. R. B. STARK. *Plast. Reconstr. Surg.*, 1948, 3: 694.

The cross leg pedicle flap is an expedient for the transplantation of whole thickness skin and subcutaneous tissue to a defect of the foot or leg. From the point of view of the comfort of the patient, the medial aspect of the calf and the anterior aspect of the thigh offer the best donor sites upon which to construct pedicled flaps. The posterior aspect of the calf and the medial aspect of the thigh also have been used as donor sites for either open or tubed pedicles. The relative vascularization of the soft tissues of the various areas of the lower extremity cannot be determined by reference to standard texts of anatomy.

Several methods were used to gain information concerning the location of macroscopic arteries of the various surface areas, the size of the arteries, and their relative, quantitative vascular beds. Cadavers from the anatomical laboratory were used. After withdrawal of the embalming fluid from the arteries, commercial umbrathor (colloidal thorium dioxide, from 24 to 26%) was injected into the arterial tree through a cannula in the femoral artery. The degree of filling was determined by x-ray examination of the extremity. Once filling had been accomplished, circumferential flaps of whole thickness skin and subcutaneous tissue were cut from the extremity, just above and just below the knee. They were removed completely from the extremity, the line of dissection being accurately placed at the junction of the subcutaneous tissue and the fascia. The upper margin of the circumferential flap of the leg was at the level of the medial condyle of the tibia and the head of the fibula with its vertical incision along the crest of the tibia. The size of the usual pedicled flap allows only three possible donor areas in the leg: the medial, posterior, and lateral. The thigh affords four possible donor areas: the anterior, medial, posterior, and lateral. In an endeavor to determine the relative vascularity of the three available donor sites of the leg, the circumferential band of whole thickness skin and subcutaneous tissue was divided by lead markers into equal medial, posterior, and lateral thirds. The same procedure was used upon the flap from the thigh where four possible donor sites were demarcated equally. Roentgenographs were taken of these circumferential flaps. Inspection of the films showed that the arteries which reach the tissues of the surface were accurately outlined by the opaque medium.

In the second method of study a refrigerated unembalmed cadaver was used. The vascular tree of the right lower extremity was washed out with physiological saline solution. Liquid latex rubber was injected into the arterial tree. After the body had been refrigerated for approximately a month, a circumferential flap was cut below the knee as outlined previously. The flap was subdivided by an incision into three equal donor areas. Each rectangular block of tissue was placed into a separate basin where all of the soft tissues were digested by a solution of sodium hypochlorite, according to Danforth's method. The tissue digestion left the unaffected latex vascular casts. Since the latex filled only the arterial tree, the casts represented molds of the arteries of the skin and subcutaneous tissue. These molds were carefully weighed.

The observations reported herein indicate that the medial aspect of the calf and the anterior aspect of the thigh are donor sites of choice since it has been shown that arteries are most abundant in these areas. The posterior aspect of the calf and the posterior aspect of the thigh show the fewest arteries. It is known that pedicles from the posterior third of the calf may be used with success if cautiously delayed, but this area is not the donor site of choice, and its indiscriminate use may occasionally lead to failure. The lateral third of the calf has an arterial supply second to that of the medial third of the calf, but it is usually difficult to base a pedicle upon that surface. The medial aspect of the thigh has somewhat fewer arteries than has the anterior aspect of the thigh but the difference is not great. Clinically this area has been used principally for tubed pedicles with success. FRANK F. KANTHAK, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Sequelae of Electrocution and Infiltration of the Stellate Ganglia (Séquelles d'électrocution et infiltration stellaire). PIERRE OURY and RAYMOND DENNIEL. *Presse méd.*, 1949, 57: 147.

The authors report 2 most interesting cases in which the late sequelae of electrocution were cured rapidly by novocain infiltration of the stellate ganglia.

The first patient presented the picture of severe vasomotoric disturbances of both hands 2½ months after an electric shock. The hands up to the wrists were of bright red color, "like lobster claws," extremely edematous, and quite limited in movement. The patient complained of diffuse dull pains and was unable to do any work. Ten infiltrations of the stellate ganglia, four on the right side and six on the left, brought about complete cure.

The author discusses the probable mechanism of this spectacular cure. It is interesting that infiltration of the sympathetic ganglia has a beneficial effect not only on spasms of the blood vessels as in Raynauds disease but also in extreme dilatation as in the present case.

The second case was that of a patient who, 10 days after an electric shock, developed attacks of dyspnea, precordial pain, and severe palpitations. Examination of the heart and vascular system were negative; an electrocardiogram was not done. Four infiltrations of the left stellate ganglion resulted in complete cure.

In view of these spectacular successes, the author discusses the advisability of performing infiltration of the regional sympathetic ganglia routinely after all electric injuries in order to prevent secondary vasomotor disturbances.

WERNER M. SOLMITZ, M.D.

Wounds of the Extremities. SIR THOMAS FAIRBANK, F. A. R. STAMMERS, R. J. FURLONG, J. M. P. CLARK, and Others. *Brit. J. Surg.*, 1949, War Surg. Supp. 2.

This summary of the principles of military surgery is based on the experience of surgeons of the British Armed Forces in World War II. In wounds of the extremities, which formed such a large proportion of the total, the results generally were definitely better than those in the First World War. In both wars, the treatment of the wounded in the later campaigns reached a standard which, for various reasons, was impossible in the earlier. The rate at which the number of cases of unhealed wounds has diminished since the end of the war speaks for itself, when we recall that after the First World War thousands of similar cases required repeated admission to the hospital over a period of many years.

Some of the numerous factors which contributed to the improved results were: the better organization of the medical services and mobile surgical units prepared to function anywhere, but particularly as close to the front line as circumstances permitted; these units brought operative surgery to the more severely wounded at the earliest possible moment, which fact is rightly regarded as being of paramount importance.

In Britian, the mistakes of the First World War were avoided, much greater care being taken in the selection of suitable hospitals for the reception of convoys, and in ensuring that patients in need of specialized treatment were transferred to suitable units without delay. There were far more specialists available to handle cases of exceptional difficulty. Resuscitation teams were at hand wherever the surgeon went, saving innumerable lives, and in desperate cases transfusion was started as far forward as the Aid Post and continued in the ambulance as it traveled to the surgeon.

The actual surgical treatment was performed along the same lines as in the earlier war in wounds of the extremities but with modifications as a result of further experience, discoveries, and new ancillary treatment. Pains were taken to train the young uninitiated surgeons, for it was soon recognized that the most single important factor in the treatment of all wounds was the skill and efficiency with which the primary surgical treatment was carried out. With regard to muscle damage in particular, the truth of this is generally accepted. The sulfonamides and antibiotics cannot replace surgery entirely in the treatment of wounds. Modern surgical treatment employs many adjuncts to the operative techniques, that are of great value. Chemotherapy, fluid replacement, transfusion of whole blood and the various fractions of blood employed as substitutes, potent anesthetic agents, and narcotics properly administered are of inestimable value in treating the wounded.

The ever present necessity for evacuation to the rear divided the technical surgical management into: first aid measures, initial wound surgery, secondary wound surgery at the base as definitive or reparative, and reconstructive and rehabilitation measures. The phases of surgical treatment as listed above in general with the military echelons, just as the placement of the various types of hospitals and, consequently, the provision of facilities for surgical treatment were determined by the geographic deployment of a military force. The essential feature about organization in the forward areas is that it should be elastic, and from the surgical point of view, the establishment of field surgical units, and field transfusion units, together with casualty clearing stations and new field dressing stations, made this possible. The most important advances affecting the medical services during the Second World War were: (a) the well organized service by which blood and other intravenous fluids, including plasma, were readily available in adequate quantities; (b) the development of highly mobile surgical units—the Field Surgical Unit; (c) chemotherapy, particularly penicillin; and (d) better means of communication, since the fate of casualties depends upon them in great measure; to these should be added the Bailey Bridge, the bulldozer, and the jeep.

In forward areas specialist teams were tried but they were not a success since in most instances casualties could not be held long enough postoperatively for adequate observation. It was found best, because of improved and more rapid evacuation and transport, to place specialist teams at the Base or on lines of communication farther back where there were special units for fractured femurs and other complicated fractures, the chest, the head, burns, vascular injuries, and peripheral nerve injuries. The only exceptions to placing specialist teams at Base were the placing of neurosurgical and maxillofacial units along the lines of communication in the Army Area.

The first surgical intervention then, in everything except neurosurgical and maxillofacial lesions, was made by general surgeons in the forward areas, and there was no question of segregation of special types of cases until the Base was reached. These forward surgeons were picked, experienced surgeons, able to tackle anything, and their real task was to eliminate factors that were of immediate danger to life and limb, and to prepare the patient for later reconstructive procedures to be undertaken on the lines of communication or at the Base.

The principles involved in the care of wounds of the extremities and the parieties do not differ from those applicable to all wounds. Primary considerations are: (1) arrest of hemorrhage and treatment of shock; (2) prevention of additional contamination and trauma; (3) diagnosis of the extent of the injury; (4) conversion of a contaminated wound into a clean wound if the time interval permits; (5) removal of foreign material and devitalized tissue; (6) repair of injured structures; (7) purposeful splinting and dressing to provide rest and an adequate circulation for the injured tissues, whether bone or soft tissues; and (8) clean surgical care until healing is complete.

First aid, resuscitation and transport. Every man carried on him a first aid dressing, and when wounded either he or some comrade applied it to the injured part. If ambulatory, he would make his own way to the regimental aid post or to some other collecting post, otherwise he was rescued by stretcher bearers readily; larger dressings (shell dressings) and splints such as the Thomas splint would be applied for femur injuries. Then he was taken by ambulance to the advanced dressing station where a medical officer made any necessary adjustments to the dressings and to splints, administered antitetanus serum, morphine when necessary, and 2.5 gm. of sulfonamide by mouth, which was to be continued throughout the journey. Blood, plasma, and glucose-saline solution were available at Advanced Dressing Station and full resuscitation could be given. For extensive muscle injuries gas gangrene antitoxin was administered. It was a rule that no wound should be exposed unless the patient was in severe pain or showed a rising pulse and temperature.

Loss of blood. It has been demonstrated by hematocrit, blood volume, and clinical studies that in major muscle wounds the loss of blood is usually great. It soon became appreciated that plasma and glucose-saline solution were of value, but that replacement of blood by blood was the best treatment. Excessive transfusion was harmful and in some cases was followed by anuria and uremia.

Dehydration. Most wounded men were in a state of dehydration. Heat in warm regions, sweating, and diminished fluid intake during combat increased the body temperature sometimes to 103 or 104 degrees. After hemorrhage, dehydration, together with the outpouring of serum into bruised tissues, often led to hemoconcentration and accounted for an erythrocyte count of 6,000,000 and the hemoglobin at 112 per cent. Glucose-saline solution given intravenously in adequate amounts (from 5 to 7 or 8 pints daily with sodium chloride not to exceed from 10 to 12 gm. daily) corrected dehydration. The daily output of urine should be over 1,000 c.c. and must be not less than 500 c.c.

Infections and other results of injury. Gas gangrene is a specific disease of devitalized muscle and its genesis is the whole environment of war, for the circumstances under which a fighting force lives, works, and is wounded are such as to encourage it. The incidence may be as high as 5 per cent with a mortality of 50 per cent, but with increasing experience these figures were reduced to about 1 per cent and 20 per cent, respectively; and after penicillin became available the mortality was reduced to about 10 per cent. It cannot be emphasized too strongly that no crushed or lacerated muscle is free from the danger of gas gangrene and all crushed, torn, and devascularized muscle must be excised to eliminate the nidus most favored by the clostridia. The fundamental factor in the disease is damage to the blood supply, and anything that embarrasses the circulation of the limb, such as tourniquets, tight bandaging, badly applied splints, and the trauma of ambulance journeys, encourages it; the more general factors of severe hemorrhage, exposure, starvation, and absorption of toxic products of infection and muscle necrosis render the victim more susceptible. Various color changes are observed in and about the wound, the muscle being plum-colored, salmon-red, greenish-black, or black with a general tendency toward dryness, such discharge as there is being foul-smelling serum which may or may not contain bubbles of gas. Occasionally the diseased muscle is yellow and friable. An outstanding feature is that the involved muscles neither bleed nor contract when cut. The skin is affected late, but as tension increases it becomes pale, and later becomes mottled from hemolysis. With gas-forming organisms it is tympanitic. Of great importance is the intense necrosis that results in the liver and kidney cells which accounts for the common terminal symptoms of scanty blood-stained urine or anuria.

The symptoms may declare themselves as early as 5 or 6 hours, but usually appear from 24 to 48 hours, after wounding with sudden onset and rapid advance. The victim becomes pale, livid, anxious, afraid, or euphoric, but is mentally alert. His pulse quickens and becomes feeble, dicrotic, and running; the blood pressure is low; the extremities are cold, blue, and clammy. The temperature varies from some rise to subnormal and is not significant. These facts emphasize the crucial difference between contamination and infection; the most important fact in the established case is the profound toxemia. The picture is one of peripheral vascular failure, and mimics three other conditions, namely, advanced peritonitis, major muscle wounds of 3 or 4 hours' standing, and acute hypoproteinemia. Such patients are utterly prostrated, and unless immediate and vigorous surgical measures are applied death is imminent. Gas, when present, can be demonstrated by roentgenographs. Errors arise by the attempt to diagnose the condition by its odor; many contaminated wounds are by necessity malodorous but in the absence of severe prostration this does not point to gas gangrene. Penetrating wounds may permit the entrance of air into the soft tissues which may give a sensation of surgical emphysema.

Treatment is essentially prophylactic from the moment of wounding. It is assumed that first aid is properly executed—adequate splinting, bandaging that is adequate and not too tight, strict adherence

to the rules regarding the application of tourniquets, correct application of the Thomas splint, keeping the patient warm, relief of pain, administration of antitetanic and gas gangrene antitoxin, control of shock, and transportation to the nearest surgical center with dispatch.

The proper surgical treatment of all wounds is a requisite; but for the established case blood transfusion, antitoxin, and penicillin are essentials. All affected muscle must be excised and this may be done best by removing the entire muscle from origin to insertion and remembering that the blood vessels of the muscles run within the bellies longitudinally, which explains why the infection tends to spread longitudinally. Large muscles like the adductor magnus may demand only partial resection, but it may be necessary to sacrifice the entire gluteal group. All discolored muscle and any that does not bleed or contract must be excised. A limb may be so disorganized that amputation is the only solution. A heavy penicillin frosting is applied to the wound and 100,000 units of gas gangrene antitoxin are given intravenously. Penicillin, blood transfusions, fluids, and plasma are administered postoperatively.

Tetanus. Every soldier was protected by tetanus toxoid before going abroad and, if wounded, was further treated by antitetanic serum. The experience of the Americans and the French indicates that tetanus toxoid is sufficient. The incidence of tetanus was exceedingly low and, as in the case of sepsis generally and for clostridial infections in particular, adequate surgery with dispatch is the best safeguard against the disease.

Trauma and malaria. In malarious areas trauma might precipitate acute clinical malaria even though it were controlled hitherto by suppressive antimalarial agents. High fever and malaise were indications to examine a blood film. The cerebral type was confusing in the presence of a head wound or in cases of fat metabolism from limb injuries.

Anuria. This dysfunction was associated with crushed limbs, major muscle wounds, gas gangrene, abdominal wounds, transfusions of excessive amounts of blood or of incompatible blood, and large doses of sulfonamides, which precipitated acetylated derivatives with blockage of the tubules, ureters, and pelves; in addition, transfusions, either excessive in quantity or of incompatible blood, lead to choking of the glomeruli and tubules by agglutinated and disintegrated red corpuscles. In extensive burns, severe dehydration and hypoproteinemia lead to hemoconcentration and oliguria and because of delayed treatment may progress to anuria. Since the war, Trueta and his coworkers have proved by experimental crushing of limbs that the main arteries in the lower limbs pass into spasm which ascends the vascular tree until the renal arteries are reached and are similarly affected. It has also been postulated that lacerated muscle was absorbed into the circulation which led to a prolonged fall in the blood pressure, as a result of which irreversible degenerative changes took place in the renal cells from ischemia.

The onset of anuria is heralded when the urine becomes dark and scanty and finally suppressed; the tongue and skin are dry and the blood urea rises to uremic levels (300–400 mgm. per cent). Patients developing oliguria may recover or may develop anuria, dying between the sixth and eighth days. Anuria resulting from large doses of sulfonamide is treated by pressing fluids and trying to dislodge the deposits in the ureters by ureteric catheterization. For the remainder, alkalinization and fluids form the mainstay of treatment. Since the war, peritoneal dialysis, artificial kidney, and the injection of novocain around the celiac ganglia to abolish renal vessel spasm have been advocated.

Fat embolism and the effect of blast. It was not an uncommon experience to find a patient with a limb injury who became drowsy from 24 to 36 hours postoperatively, then lapsed into coma, and died with cerebral manifestations 2 to 4 days later. Papilledema was never present, and retinal hemorrhages were found rarely. Neck rigidity occasionally evolved, reflexes were usually exaggerated, and signs of a pyramidal tract lesion, such as extensor plantar response, sometimes appeared. When lumbar puncture was performed there was no finding grossly. The brain at autopsy showed the same changes in both groups of cases—generalized petechial hemorrhages throughout the white matter. When lung complications were also present, the bubble of air beneath the pleura suggested that the whole condition resulted from blast. It seemed probable that when the cerebral signs were present from the beginning the condition was one of blast, but when they were delayed they resulted from fat embolism. Some of the specimens at the Base showed fat globules in the kidneys, urine, and brain. There was no effective treatment for either.

The surgical treatment of wounds. The influence of time, terrain, climate, and type of missile is fundamental. In active, moving warfare in which it is not possible to hold any but the seriously wounded men in the Forward Areas, there is no place for primary suture. This is because the majority of casualties will be subjected to the trauma of long ambulance journeys of unpredictable duration over bad roads, during which time they will not be under constant observation of a surgeon who might detect impending complications.

Infection remains relatively superficial for the first 8 hours after wounding, and is less severe in a dry climate than in a cold, wet one. It is, therefore, easier to render a wound surgically clean if treated within 8 hours of wounding, and units should be deployed accordingly. The heaviest contamination of wounds occurs in cold, wet weather when fighting is in the liquid mud of highly cultivated soil. Such wounds require thorough excision at the earliest possible moment, and anything less carries the grave risk of spreading cellulitis, septicemia, and gas gangrene, and, in any case, a wound unfit for early suture. Penicillin and sulfonamides are not substitutes for surgery—they are valuable adjuncts.

Nothing less than excision of contamination is safe, but this does not mean block excision. A wide area of skin around the wound was washed with soap and water and shaved, and usually some spiritous solution was applied. Because of the value and the viability of skin, the practice of removing a rim of about one-eighth of an inch was abandoned; only the frayed edge was removed. In order to inspect the depths of the wound it was extended sufficiently to permit the insertion of retractors down to the bottom. This necessitated generous longitudinal incisions of the deep fascia, which had the added advantage of decompressing edematous, congested tissues and reducing the incidence of vascular spasm; for the same reason transverse incisions also were sometimes employed. There was no fear of making incisions too long since they were to be sutured at the lines of communication, or at the Base in a few days. Tags of fat or fascia, or any soiled area of either, were removed. All muscle that did not bleed or contract when cut was excised. Imperfect removal carries with it the danger of sepsis which would nullify the general policy of delayed primary suture. Search was made for pieces of indriven clothing and other foreign bodies, and these, together with any readily accessible fragments of metal, were removed. All spaces that might harbor pus were laid open. Until the last year of the war, pieces of bone wholly detached from periosteum were removed, but, as already recorded, it was discovered that in the presence of adequate penicillin this was no longer necessary. The operation was completed by insufflating penicillin-sulfonamide powder until there was a heavy frosting. The wound was not packed. Vaseline gauze with 5 per cent sulfonamide was popular at first, but once conditions were suitable for a general policy of delayed suture, under which regime the first dressing was performed at operation, the vaseline pack was replaced by a dry gauze dressing. In relatively superficial through-and-through wounds the practice was to lay open the tract, but when the penetration was deep it was the custom to treat each wound separately. Quite apart from fractures, every wound involving muscle was found to require splinting, and this had to include the joint below the wound. Finally, following surgery, no inspection of the wound was made until the patient reached the operating room where the delayed suture was to be performed. In the absence of pain or toxemia any exposure of the wound prior to this was meddlesome and led to superimposed infection.

These principles of treatment applied equally to all soft tissue wounds, whether of the limbs (with or without fractures), chest wall, back, axilla, or belly wall, although when it was essential to hold certain cases for from 8 to 10 days in the forward areas for medical reasons, as for instance abdominal cases, primary suture of such wounds was employed. The basis of the rule is the fact that stitched wounds and ambulance journeys are incompatible.

The whole plan of the policy of delayed suture was aimed at the suture of wounds within 3 to 5 days after the original excision, and treatment in forward areas became so efficient that suture could be accomplished safely in over 90 per cent of the cases, with complete healing by first intention in from 83 to 93 per cent. Experience showed that this time factor was essential, for when casualties could not be delivered for delayed closure in less than 8 or 10 days after the first operation, the proportion of successes fell from 5 per cent to 10 per cent lower. In one theater of war, during the quietude of the winter of 1944 to 1945, an experiment in primary suture in the forward area was carried out. The criteria for selection were that wounds should be not more than 12 hours old and that they should be essentially superficial, that is, although the muscle might be involved, every part of the wound was exposed and therefore no nooks and crannies were present. Such wounds were usually tangential, although several were from 6 to 8 inches long and about 2 inches in depth. Two surgeons were selected to do this work and the cases were carefully observed. The usual excision technique was employed but the wounds were sutured at the end of the operation. Altogether, 140 patients, representing 180 wounds, were treated. Of these, over 90 per cent healed perfectly after 8 or 10 days and 70 per cent returned to duty within 17 days. There were no serious failures. The 10 per cent that were not healed when stitches were removed were either moist or there was a stitch abscess and part of the wound broke down. Since the patients were under constant supervision no untoward results followed. Two of the wounds which broke down were situated over bone, and this location came to be regarded as a contraindication to primary suture. The conclusion was that primary suture should be used only in specially selected cases when it can be assured that the patients can be held for 8 or 10 days until the stitches have been removed. It is, therefore, restricted to periods of inactivity. One of the great achievements of the policy of delayed suture was that scar tissue was reduced to a minimum; with primary suture it was eliminated.

There was no doubt that in penicillin we possessed an agent that no other bacteriostatic or antiseptic equalled. When penicillin became plentiful, wounds behaved in a manner hitherto unknown. The mortality rate from gas gangrene dropped to about 10 per cent. Almost all wounds were suitable for treatment by delayed primary suture, with an expectation of healing by first intention in well over 90 per cent. Gunshot wounds of bones were converted into closed fractures within a few days; it was no longer necessary to remove pieces of bone detached from the periosteum; they became incorporated into the developing callus. The incidence of empyema in the last 200 chest cases was only 2.5 per cent. Penicillin made possible these triumphs.

Vascular injuries. Of 36 ligations of the popliteal artery, 26 required amputation above the knee joint; and of 31 ligations of the femoral artery, 21 required amputation above the knee. Given a wound in the lower third of the thigh, the popliteal space

being full and tense, and the condition of the limb below the knee pointing to vascular embarrassment manifested by coldness, swelling, numbness, and the absence of pulse at the ankle, exploration was deemed the safest line of action. The wound was treated in the usual manner, but as the clot was being evacuated from the popliteal fossa the artery, whether completely or partially severed, usually began to bleed anew. In the completely cut artery, ligation of each end was carried out. Sometimes a partially divided artery was successfully sutured. Even when suture of a partially divided artery was possible, thrombosis usually took place. However, when the calf or forearm muscles became swollen and woody hard, with the flexors in contracture, the skin cold, insensitive, and mottled, and with absent pulses, such changes were irreversible and amputation above the knee or the elbow was necessary.

An important point in the management of cases of ischemic necrosis of muscle resulting from prolonged application of a tourniquet was to avoid removal of the tourniquet, since experience showed that this permitted an overwhelming dose of myotoxin to enter the circulation rapidly. Amputation should be above the tourniquet; a second higher one can be employed to control hemorrhage in the operative area if thought necessary.

Patients that developed vascular aneurysms were sent to vascular injury centers. Experience suggested that waiting for the development of an aneurysm after injury to the main vessel was the best way to save the limb.

Measures which were used to safeguard the peripheral circulation were: nonremoval of the patient until the fate of the limb was clear; keeping the affected limb cool by elevating and uncovering it and by the use of an electric fan; and the application of electric heaters to the trunk to encourage vasodilatation. Paravertebral blocks or sympathectomy were not practiced to any extent. Another lesion that threatened the vitality of the limb was traumatic vasospasm, or thrombosis of the main artery resulting from concussion or bruising by a missile having passed nearby.

Injuries to the peripheral nerves. Rough tests for voluntary movements and sensation were made in all limbs injured and the findings recorded. Until the last few weeks of war primary suture of cut nerves was discouraged and no attempt was made to rectify the situation until several weeks later at the Base. This policy was based on the knowledge that nerve suture in the presence of infection was doomed to failure, but when the ends of severed nerves were seen during operation, they were often connected loosely by a solitary stitch as a guide for future intervention. During the last period of the war, with penicillin plentiful, surgeons began formal nerve suture at the time of the delayed suture. This would save much time, and it promised success since not only did the technique give clean wounds but the early closure eliminated the formation of scar tissue; the nerve would then lie in a bed of normal tissue.

Amputations. Early in the war, before the policy of routine delayed suture of all wounds became a practical proposition, the tendency was to save as much of the limb as was viable, and leave it to the surgeons at the Base or in the United Kingdom to perform a secondary and definitive amputation suitable for prosthesis. With growing experience the Syme and Stokes-Gritti procedures were largely abandoned and surgeons conformed to the principles laid down between the wars by limb-fitting surgeons. After penicillin became available amputations performed in the forward areas were suitable for delayed suture within 5 days and healed by primary intention. It became necessary to plan primary amputations as definitive ones. Broadly speaking, two amputations for both the upper and lower limbs were dictated by the form of prosthesis provided by the Ministry of Pensions. This was of the bucket type of artificial limb, with circumferential weightbearing. The two sites advocated for the upper limb were below and above the elbow. The best site below the elbow was 3 inches above the wrist; and the shortest stump that would support an artificial limb had to have at least 1 inch of ulna beyond the biceps insertion with the elbow flexed. In the above-elbow amputation the site of selection was 3 inches above the joint; and not less than 1 inch of humerus below the anterior axillary fold would control the socket of the artificial limb. For the below-knee amputation the tibia was 5½ inches from the line of the knee joint, although 4 inches was sufficient. Nothing less than from 2½ to 2 inches was of any use. Above-knee amputations should be through the lower third of the thigh, or about 10 inches from the tip of the greater trochanter. The shorter the femoral stump the less adductor power remained, and anything less than 4 inches required a tilting-table limb. Following a coneshaped amputation with abundant skin flaps, with or without crushing of nerves, the flaps were left wide open, penicillin powder was insufflated, gauze dressings were applied, and the stump was splinted. After 2 or 3 days the amputee was evacuated to a "delayed suture center," and after suture one anticipated healing by first intention in over 90 per cent of the cases.

Joint injuries. In the early days of war wounds, the wounds of the major joints were rightfully regarded as serious lesions because even when the limb was saved it was at the price of a stiff joint resulting from sepsis. After the importance of thorough surgical toilet was established, improvement followed, and with penicillin the number of stiff joints became far less. The wound was excised in the usual manner, and the rent in the capsule was enlarged sufficiently for exploration of the joint cavity. Loose pieces of cartilage or bone and foreign bodies were removed. Blood clot was washed out. The capsule was closed when possible, and a solution containing 25,000 units of penicillin was injected into the joint cavity. The skin incision was left wide open and the wound dressed with gauze. The limb was then put up in plaster, extension being applied when possible. In

the case of the knee joint, the Tobruk splint was used, and as long as the extension was adjusted at frequent intervals, these patients traveled very well. In cases in which the patella or the olecranon process was badly comminuted, it was usual to excise the fragments.

Fingers and toes. It was important to apply splints to the hands and feet in such a manner that the fingers and toes remained free, and to encourage activity from the beginning. This guarded against adhesions and militated against crippling stiff digits. When possible the wrist was also left free, but in cases of musculospiral involvement it was put up in dorsiflexion. This was also practiced when the flexor muscles or the tendons of the wrist and fingers were cut, as otherwise contracture was likely to occur. Even in hand wounds fixation was reduced to a minimum and active and passive movements of the fingers started as soon as possible.

Splinting for fractures was *sine qua non*, but from what has already been said in regard to the hazards of transportation, adequate immobilization is vital in wounds of the soft tissues. For first aid work, Thomas knee splints and Cramer wire were most commonly used. Extension was applied through a clove-hitch or a Milbank clip. The extension was tightened by a Spanish windlass which was checked often during transport. For postoperative splinting, plaster of paris was invariably used. Experience taught that skin-contact plasters and even padded plasters that were not split were a hazard. Therefore, every plaster splint was padded and all except the Tobruk type were split before evacuation. The thoracobrachial splint, binding the upper limb to the trunk, was the favored splint for evacuation when the bones involved were those of the shoulder, arm, or forearm. For fracture of the forearm, a long plaster slab was molded to the posterior surface of the limb from the shoulder down to the metacarpophalangeal joints, and kept in position by encircling bands of plaster. This was fixed to the trunk by a light plaster jacket. The cast was split before evacuation.

Fractures of the femur, whether they were high, in the midshaft, or supracondylar, were treated by skeletal traction. Mobile, balanced skeletal traction was employed by introducing a Steinmann pin through the tibia at the level of the tuberosity, and attaching a pull of 15 pounds, which after 6 or 8 weeks was reduced to 10 pounds. The thigh and the leg were rested on a Braun's splint. The difficulty in high fractures was to control the flexion of the short upper fragment, it being necessary to bring the lower fragment into apposition with it. In midshaft fractures, skeletal traction was employed but the limb was cradled in a Thomas splint slung to a Balkan frame. In supracondylar fractures, in addition to the methods described, it was often necessary to insert a Kirschner wire through the proximal tip of the lower fragment and apply vertical traction to the lower fragment. Active knee flexion followed as soon as muscle control of the limb was present. In these cases, callus formation was often rapid and union often occurred in about 8 weeks. The British favored and used closed reduction of fractures of the upper extremity, the leg, and foot, in almost all of the cases. Only in very exceptional instances was skeletal traction required. It was found that proper reduction of these fractures with adequate plaster of paris splinting gave very satisfactory results.

When penicillin became available the authors decided to plate a series of fractures which were considered suitable for this procedure. Plating must have a limited application because the majority of fractures are grossly comminuted and if there are more than three fragments it is unlikely that the plate can be fixed securely enough to hold the fragments in reduction or to render the fracture stable. To be effective the plate must be long and the screws must hold tightly in both cortices. In a consecutive series of 70 cases with missile fractures of the femur, only 16 were found to be suitable for plating. In some patients, the knee movement increased rapidly during the early stages of physical therapy, but except in a few instances the final range was usually less than that in patients treated by balanced skeletal traction. At the end of 3 months, the same proportion of closed wounds was found as among the patients treated without internal fixation. Other complications of internal fixation were: persistent sinus formation, requiring removal of the plate, and loosening of the plate with infection. The subsequent history of patients treated with internal fixation reveals that in the majority, the plates need to be removed because of persistent quiet infection and toxemia, and inevitably the plate is responsible for delayed union.

Skin grafting was used much earlier than in previous wars, even within a few days of the wounding. However, only under exceptionally favorable circumstances were skin grafts applied at the primary operation. At a later stage, even when drainage was still necessary, a large raw surface could often be reduced by grafting to little more than a sinus.

JOHN H. MOHARDT, M.D.

Osteoporosis Following Burns. NEAL OWENS. *Brit. J. Plast. Surg.*, 1949, 1: 245.

Sudeck's osteoporosis was detected in 8 patients following first and second degree burns. Osteoporosis may be considered as a possible burn complication because of the acidosis, the negative nitrogen balance, the endocrine imbalance, and the other metabolic disturbances associated with burn trauma.

The diagnosis of osteoporosis is rendered difficult in burn patients because of bone pain, muscle atrophy, edema, and disuse of the involved extremity. X-ray examination of the involved bones shows irregular areas of rarefaction and progressive decalcification. Secondary infection complicating a burn is also a predisposing factor to osteomyelitis and spontaneous fracture.

Although the cause of bone atrophy is not definitely established, it is believed to be due to trophoneurosis or chemical biological changes in skeletal

calcium. Meticulous care of the metabolic balance involving nitrogen, calcium, and phosphorus must be observed in the treatment of burn cases. Prompt skin coverage so as to allow for early motion is also requisite for the prevention of osteoporosis. Surgical or chemical sympathectomy is not indicated for this type of osteoporosis.

BENJAMIN G. P. SHAFIROFF, M.D.

Some Observations of Curling's Ulcer. F. BRAITHWAITE and P. H. BEALES. *Brit. J. Plast. Surg.*, 1949, 1: 284.

Curling's ulcer is an ulceration of the duodenum following extensive burns of the body surface. The development of infection in the burned areas is a likely factor in the cause of such ulcers because their incidence has considerably decreased since the advent of penicillin. These lesions also occur with other septic conditions.

Two cases are reported. In the first, the burns involved 65 per cent of the body surface and hematemesis started on the tenth hospital day. This continued intermittently until death about 10 days later, despite blood transfusions. Autopsy revealed an ulcer of the duodenum 4 cm. in length which had eroded into the gastroduodenal artery. In the second case, severe burns of the hand were followed in a week by abdominal pain before meals, and in 3 more days hematemesis and melena developed. These continued till the patient was in shock. Continuous blood transfusion was necessary and laparotomy revealed a duodenal ulcer similar to that in the previous case. A partial gastrectomy was performed and an uneventful recovery followed.

These ulcers grow rapidly in width and depth and there was no indication of repair in either of the cases presented, which suggested that when extensive hematemesis or melena occurs 1 or 2 weeks following surface burns, surgery is indicated. Immediate medical measures are urged for any signs of abdominal distress following such burns.

STANLEY W. TUELL, M.D.

ANESTHESIA

Studies of the Circulation of Anesthetized Patients by a New Method for Recording Arterial Pressure and Pressure Pulse Contours. KENNETH F. EATHER, LYSLE H. PETERSON, and ROBERT D. DRIPPS. *Anesthesiology*, 1949, 10: 125.

A practicable method for the recording of direct arterial pressures involves insertion of a small plastic catheter into a brachial artery. Pressure changes are recorded by connecting the catheter to a capacitance manometer. This method supplies accurate beat-to-beat pressure readings, pulse rate, and evidence of changes in the cardiac output and peripheral resistance as they occur.

Direct recordings from approximately 100 patients during anesthesia and surgery have demonstrated their practical value in supplying a knowledge of alterations in the circulation. Such information can be of value to measure such phenomena as the circulatory effects of traction and visceral manipulation during operation, abnormal cardiac rhythm and force of cardiac contraction, the effect of posture on the circulation, the circulatory action of drugs commonly used by the anesthesiologist, and the effect of changes of pressure within the respiratory tract.

The method is recommended as an adjunct to the study and evaluation of patients subjected to anesthesia and surgery. It is of particular value when patients are considered poor risks, during pulmonary and cardiac operations, and during the development of new surgical techniques.

MARY FRANCES POE, M.D.

Convulsions Under Anesthesia in Children. STANTON BELINKOFF. *Current Res. Anesth.*, 1949, 28: 40.

Convulsions under anesthesia present a serious problem. If allowed to continue, a severe degree of anoxia, permanent brain damage, or death may result.

The immediate treatment of choice is the slow intravenous administration of a 2.5 per cent solution of sodium pentothal. If venipuncture is impossible, 20 c.c. of pentothal should be given rectally. Curare is another agent that may now be added to the list of useful drugs in combating this complication. When it is impossible to perform a venipuncture to administer the curare, it may be given intramuscularly, even though the effect of the drug may not be apparent for several minutes.

The patency of the airway must always be assured. Oxygen should be administered continuously, if necessary, by artificial respiration or intratracheal insufflation. MARY FRANCES POE, M.D.

Pathologic Findings in Some Deaths during Anesthesia. KEITH BOWDEN. *Med. J. Australia*, 1949, 1: 86.

An analysis is made of the last 50 unselected deaths under anesthesia which occurred in Melbourne on the operating table, before operation was commenced or completed, or in the postoperative period before the patient recovered from the anesthetic. The group serves chiefly to emphasize that insufficient regard for the well established principles in the administration of anesthetics sometimes leads to disaster. The analysis is given in table form and the relevant facts are tabulated as far as they could be gathered for each case. The cases are divided into five categories:

1. Deaths caused by the disease for which the operation was designed and the anesthetic given.
2. Deaths resulting from disease present, apart from the disease for which the operation was undertaken.
3. Deaths directly due to the anesthetic.
4. Deaths due to the operative procedure, shock, or hemorrhage.
5. Deaths due to the complications of anesthesia, such as the inhalation of vomitus.

Much information of practical value emerged from the study of these cases. The time-honored practice of waiting until 4 hours have elapsed since the last meal and then giving an anesthetic under the impression that the stomach will be empty, has led to many fatalities. One patient had no solid food for 28 hours preceding anesthesia and died from asphyxia from inhaled vomitus. The fact that asphyxia can and does occur in the absence of frank cyanosis was stressed. Also, the use of a laryngoscope, bronchoscope, and suction might prove a life-saving measure, as might laryngotomy or tracheotomy with efficient suction.

The more thorough the postmortem examination the less does one have to fall back on status lymphaticus as the cause of death. It is not very well known that laryngospasm in the induction stage may be fatal, a fact that should make the anesthetist pause before he proceedes to pour on more anesthetic to get the patient over a spasm.

Twenty-seven of the deaths may be regarded as having been theoretically preventable; 14 of them showed typical asphyxia as their cause. After completion of an operation on the nose, throat, or mouth, the patient should be turned on his side and put to bed in this position until he has recovered from the anesthetic, and no patient should be removed from the operating theater if he presents any traces of cyanosis.

The author concluded that there is a certain amount of risk with every anesthetic administered and that that risk can be made only the irreducible minimum when due regard is paid to the well established principles governing the administration of anesthetics and the immediate after-care of the patient.

MARY KARP, M.D.

The Effect of Vasoconstrictors Upon the Duration of Spinal Anesthesia: A Controlled Study in Man. KENNETH E. BRAY, SIDNEY KATZ, and JOHN ADRIANI. *Anesthesiology*, 1949, 10: 40.

The use of a vasoconstrictor in local anesthetic solutions for infiltration or block anesthesia has long been accepted technique, but the use of these agents intrathecally for prolongation of spinal anesthesia has not been widely accepted. Cullen studied the effect of a vasoconstrictor with procaine for spinal anesthesia, and the authors have studied the action of nupercaine and pontocaine with several different sympathomimetic drugs added. The study was unusually well controlled, for every patient received at least two spinal anesthetics of the modified saddle block type. One group of patients received no vasoconstrictor in either of the anesthetic mixtures, while other groups were given first one injection without vasoconstrictor and later another anesthetic employing the anesthetic drug with some sympathomimetic agent. The vasoconstrictor agents studied were epinephrine, neosynephrin, ephedrine, and oenethyl.

There were variations in the duration of anesthetics given to the same patient, regardless of whether or not a sympathomimetic agent was employed. However, the figures used for comparison represented the average durations, and significant results were obtained. With nupercaine and vasoconstrictor, the average difference in duration of anesthesia was an 0.38 per cent increase, which is not significant, and the average durations of anesthesia were altered the following amounts by the different sympathomimetic agents: ephedrine, 50 mgm., a decrease of 4.9 per cent; neosynephrine, 5 mgm., an increase of 8.0 per cent; epinephrine, 1 mgm., an increase of 36.2 per cent. With the use of pontocaine without a vasoconstrictor, the average difference in duration of anesthesia was 2.3 per cent decrease, and the average durations of anesthesia were altered the following amounts by the different sympathomimetic agents: ephedrine, 50 mgm., an increase of 6.68 per cent; neosynephrin, 5 mgm., an increase of 8.15 per cent; oenethyl, 100 mgm., an increase of 1.6 per cent; epinephrine, 1 mgm., an increase of 61.56 per cent.

There were 10 significant rises in blood pressure and 15 significant falls in blood pressure during anesthesia in a total of 341 anesthetics. No delay was noted in the onset of anesthesia when a vasoconstrictor was combined with the spinal anesthetic drug.

The authors concluded that changes occurring with ephedrine, neosynephrin, and oenethyl were not clinically significant. Epinephrine proved to be the only vasoconstrictor which prolonged the duration of anesthesia appreciably with either pontocaine or nupercaine. No neurologic complications or sequelae were noted in any cases.

R. GIBSON PARRISH, M.D.

Anatomic Reasons for Caudal Anesthesia Failure. M. GENE BLACK. *Current Res. Anesth.*, 1949, 28: 33.

The literature on caudal anesthesia leads one to believe that a persistent percentage of failures occur even in the hands of experienced anesthesiologists. This study was undertaken to determine some of the reasons for these failures and, if possible, to aid in their prevention.

In reviewing the osteology of the sacrum, we find adequate reason for many of the anatomical defects found in 104 sacra. Fifteen and three tenths per cent showed defects which made successful caudal anesthesia improbable. Absent hiatus, complete agenesis and bony septum, together with 3 cases in which spinal anesthesia appeared inevitable because of distortion, made up this group. Of the total number of sacra with defects, those showing absent hiatus appear to represent the basic minimum of failure, or 7.7 per cent.

In those cases in which caudal anesthesia is considered essential for the safety of the patient, it is suggested that x-ray studies of the sacrum will provide a valuable means of combating failure, as in many cases anesthesia may be possible but difficulties may be experienced because of the presence of structural changes and defects.

MARY FRANCES POE, M.D.

The Therapeutic Uses of Intravenous Procaine. DAVID J. GRAUBARD and MILTON C. PETERSON. *Anesthesiology*, 1949, 10: 175.

The results in the management of 448 cases in which 1,954 intravenous procaine infusions were given have been evaluated, and it is concluded that this technique should be considered as an adjuvant to the treatment of selected traumatic, inflammatory, and spastic conditions.

The importance of vitamin C therapy cannot be overemphasized. It is suggested that vitamin C be given prior to the use of large doses of procaine to increase resistance to toxic side effects, particularly in patients in a poor nutritional condition. There is evidence that interference with the reflex arc which is established following trauma will hasten the recovery and rehabilitation of the injured individual.

The intravenous administration of procaine, in conjunction with vitamin C, in the treatment of arthritis has given some promising results, and the improvement noted in spastic conditions of neurologic origin recommends this form of therapy for further clinical study. MARY FRANCES POE, M.D.

Anesthesia for Neurosurgical Procedures: Analysis of 1,000 Cases. C. R. STEPHEN and A. PASQUET. *Current Res. Anesth.*, 1949, 28: 77.

The authors review 1,000 consecutive operations performed at the Montreal Neurological Institute from July, 1946 to September, 1947 and discuss some of the problems encountered. General anesthesia was employed in 700 cases. In all of these, a patent airway was maintained by means of an endotracheal tube. Premedication for craniotomy consisted of atropine alone because of the dangers of morphine in patients with increased intracranial pressure. In other cases demerol or morphine was added. An avertin basal anesthetic was often used to allay fear in patients. This was followed by induction with ether by the closed or open method. In the majority of cases smooth induction was accomplished with small amounts of pentothal followed by gas or gas ether and intubation under direct vision. Packoffs of vaseline gauze were used almost entirely, liberally coated with 2 per cent nupercaine water-soluble ointment. A description of the sponge rubber pad for supporting the chest in the prone position is included. Maintenance was attained by the use of ether-air anesthesia, with a nonresistant, nonbreathing valve close to the endotracheal tube.

As an alternative, 123 patients were given pentothal nitrous oxide and oxygen with a nonrebreathing valve and large flows of gases of from 8 to 10 liters per minute. This combination was found satisfactory for procedures lasting up to 2 hours but in longer operations it was common to find the development of an increased pulse rate and a decreased pulse pressure. No abnormal increase in intracranial pressures was noted with this technique.

A series of 211 patients received spinal analgesia for the removal of intervertebral discs; 1 to 1500 nupercaine was the agent used and the procedure was described in detail. Only in the semicomatose and the poor-risk patient was local analgesia used without supplement, and nupercaine in 1 to 1500 and 1 to 4000 dilution with epinephrine in 1 to 125,000 dilution were the agents of choice. For arteriograms general anesthesia was employed and a deep plane of anesthesia was established during the period of manipulation to avoid troublesome reflexes from the carotid sinus. Fluid replacement was considered an important responsibility of the anesthetist. Only in sympathectomies was blood purposely withheld because in these cases a somewhat decreased blood flow was beneficial to the patient whose blood pressure was being substantially reduced by the operation. Analeptics were rarely used during intracranial operations under general anesthesia, but were of value in patients under spinal analgesia. To control restlessness under spinal analgesia, the intravenous use of nembutal was found most effective.

Complications during the induction of anesthesia were few. During operation a rapid fall of the blood pressure and a weak pulse were the most common abnormality. Two patients had severe blood reactions. Postoperative complications were not common. There were 67 deaths, 3 of which occurred in the operating room and the patients were children. Fifty of the 67 patients had received general anesthesia. MARY KARP, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

The Diagnosis of Chronic Subdural Hematoma in Children and Adolescents. J. W. D. Bull. *Brit. J. Radiol.*, 1949, 22: 68.

In chronic subdural hematomas of adults, pneumography presents certain constant features, but angiography alone can firmly establish the diagnosis prior to operation. In children and adolescents the skull is more malleable and, therefore, a correct diagnosis can often be made by roentgen examination without the use of contrast media. The subdural hematoma in newborn infants is not discussed by the author.

The material consisted of 15 cases, 13 of which were confirmed. The patients varied in age from 20 months to 20 years and fell into the following three distinct groups: group 1, with appearances similar to those seen in adults, i. e., negative findings in ordinary roentgenograms and characteristic positive findings on pneumography (3 cases); group 2, with definite pathognomonic changes in ordinary roentgenograms (9 cases); and group 3, with calcified hematoma and hemiatrophy of the affected side of the skull shown in ordinary roentgenograms (3 cases).

The main features of the 15 cases are summarized and arranged in a table.

Group 1. The 3 patients belonging in this group were 1, 11, and 15 years old, respectively. In the baby of 1 year the hematoma was encountered when the burr hole was made for ventriculography. In the other 2 cases ventriculograms showed the typical deformity seen in adults.

Group 2. The ages in this group of patients varied from 4 to 18 years. The important roentgen findings were: (1) bulging of the middle fossa on the affected side, shown in the lateral and submentovertical view; (2) elevation of the lesser wing of the sphenoid, shown in the posteroanterior view; and (3) bulging out of the greater wing of the sphenoid, likewise shown in the posteroanterior view. Dyke and Davidoff described three additional signs which were not confirmed by the author. These were: (4) atrophy of the superior and lateral wall of the superior orbital fissure, (5) hypertrophy of the frontal and ethmoidal sinuses on the affected side, and (6) thickening of the skull.

Emphasis is laid on the proper technique of roentgenography. Exposures are usually made in 5 views: right lateral, left lateral, frontal (posteroanterior) with a 25 degree tilt of the rays toward the feet to show the orbits, occipital with 35 degree tilt of the rays, and basal (submento vertical) view. The techniques of taking the frontal and basal views are described in detail.

In the author's series the time interval between the trauma and the roentgen demonstrability of the bulging of the skull was 3 months. Hardman reported the case of a boy aged 8 who had a bulging middle fossa 10 weeks after a head injury, while A. Schuller thinks that no more than 6 weeks are necessary for this sign to appear.

Group 3. The 3 cases in this group pathologically represent the end result of untreated hematomas in which calcification or ossification has occurred. They are described in detail. Two cases also showed a hemiatrophy of the skull on the side of the calcification which was parietotemporal in position. There was a marked displacement of the sagittal sinus to the affected side of the head and encephalography showed that the septum pellucidum was also displaced, which signified concomitant hemiatrophy of the brain.

The general conclusion is drawn that ordinary roentgen examination of the skull can provide the diagnosis in most cases of chronic subdural hematoma in children and adolescents and thus enable the surgeon to carry out a relatively minor curative operation. T. Leucutia, M.D.

The Roentgenologic Features of Neurofibromatosis. John F. Holt and Edwin M. Wright. *Radiology*, 1948, 51: 647.

Neurofibromatosis or von Recklinghausen's disease is characterized by multiple tumors of the peripheral nerves associated with areas of pigmentation in the skin. Less frequently an involvement of the central nervous system and of the skeleton may also occur.

The authors reviewed the findings in 127 cases of neurofibromatosis seen at the University of Michigan Hospital between 1934 and 1947, paying particular attention to the osseous manifestations. They were surprised by the frequency, variety, and yet consistency of the patterns encountered in these lesions. Slightly over 29 per cent of the total group showed some form of a skeletal defect, but these defects must have been more numerous as in 50 cases no roentgenograms were available. The bone changes were placed into 6 categories.

1. *Erosive changes.* Norgaard described these changes as the "pit or cave" due to erosion of the bone by an adjacent neurofibroma. While such defects are characteristically observed in the bones of the extremities, the authors encountered 2 cases in which neurofibromas of intercostal nerves produced bilaterally symmetrical notching of several ribs, which somewhat resembled the roentgen appearance of coarctation of the aorta.

2. *Scoliosis.* This was the most frequent osseous defect occurring in conjunction with neurofibromatosis. It may be due to a coexisting anomalous development of one or more vertebrae or to a compensatory function in overgrowth or undergrowth of a lower extremity. It occurs most commonly in the

lower dorsal region, consisting of kyphoscoliosis, with the kyphotic element predominating, but the authors also observed cervical kyphosis of varying degrees of severity.

3. *Disorders of growth.* Among these, overgrowth of one or several bones constituted the most ordinary finding. The overgrowth in the majority of the cases was longitudinal as well as circumferential, but rarely an actual diminution in the caliber with increase in the length of the bone was also found. It is significant that in all growth disturbances an elephantiasis neuromatosa of the soft tissues was present, which could easily be identified in the roentgenograms and was a helpful point in the differential diagnosis.

4. *Congenital bowing and pseudarthrosis of the lower leg.* The frequent association of neurofibromatosis and congenital bowing of the tibia (with subsequently developing pseudarthrosis) is generally accepted. However, considering the fact that neurofibromas first appear at puberty or later in life, the question arises whether a congenital bowing of the tibia may always be conceived as a precursor of von Recklinghausen's disease. The authors observed 1 case in which the sequence of events seems to lend support to the theory.

5. *Intraosseous cystic lesions.* The presence of cystic lesions is often encountered in all stages of neurofibromatosis. Apart from the subperiosteal cyst, which seems to be an established entity, the authors have found a number of cystic lesions within the cortical and cancellous bone. In some instances the lesions were located in the distal metaphyses and suggested localized fibrous dysplasia.

There were 2 cases in the authors' series which were most remarkable. In one, that of an infant 4 months old, a clinical and histologic diagnosis of neurofibromatosis was established. Roentgenograms of the skeleton revealed multiple cystic lesions of the metaphysis of many of the long bones. Thirteen months later the osseous changes had completely disappeared. In the other case, likewise that of an infant with innumerable subcutaneous tumors and very extensive bone changes, biopsy of the soft tissues demonstrated neurofibroma but three biopsies from bone failed to show the presence of a similar tumor. Therefore, the authors think that a relationship between neurofibromatosis and fibrous dysplasia may exist, although Jaffe has denied any such link.

6. *Associated anomalies of the skeleton.* These include spina bifida, fusion of the vertebral bodies, congenital dislocation of the hips, clubfoot, and other similar anomalies. In 1 patient symmetrical anomalies of the hands and feet were noted. In 2 cases the involvement of the eyelids and orbital soft tissues was associated with orbital wall defects.

The general conclusion is drawn that von Recklinghausen's disease is not a rarity and that the incidence of bone involvement is considerably greater than the figure of 7 per cent commonly quoted in the literature. T. LEUCUTIA, M.D.

The Detection of Gastric Carcinoma by Photofluorographic Methods. I. Introduction. II. Equipment Design. JOHN F. ROACH, ROBERT D. SLOAN, and RUSSELL H. MORGAN. *Am. J. Roentg.*, 1949, 61: 183, 188.

A study has been established at the Johns Hopkins Hospital, Baltimore, to determine the efficiency of examination for carcinoma of the stomach of all patients above the age of 40 who are admitted to the Dispensary Out-Patient Clinic of the Hospital by use of a photofluorographic unit. The study will be pursued for a period of 5 years. It has been statistically shown that cancer of the stomach is a prevalent and rapidly fatal disease for which the only promising form of therapy is early surgery. The equipment employed for these examinations consists of a standard 200 milliampere generator, a rotating anode tube, and a grid-screen camera assembly using a Patterson type E-2 screen and a Schmidt camera. The grid-screen camera assembly is mounted beneath a horizontal roentgenographic table to permit the examination of patients in the recumbent position. The nucleus of the installation is a 70 mm. Schmidt camera, constructed by the Danish engineer Helm. Results of the use of the equipment in the early detection of gastric carcinoma will be reported in subsequent articles. FRANK L. HUSSEY, M.D.

The Early Diagnosis of Acute Septic Osteomyelitis, Periostitis, and Arthritis, and Its Importance in the Treatment. SIGVARD JORUP and SVEN ROLAND KJELLBERG. *Acta radiol.*, Stockh., 1948, 30: 316.

The author emphasizes the importance of early diagnosis of acute septic osteomyelitis, periostitis, and arthritis.

The first roentgen sign of an acute septic osteomyelitis is the appearance of edema of the soft tissues at the site of the disease. This is manifested by a swelling of the surrounding muscles, and by blurring or obliteration of the fatty intramuscular septa. Engorgement of the vessels also appears in the subcutis. In a somewhat later stage, edema of the subcutis, which results in this layer appearing more indistinct and becoming broader than on the healthy side, is sometimes noticed as well. If the change affects a joint, a distention of the soft tissues of the joint with possibly an increase in the amount of fluid in the joint, can often be noticed. The changes in the soft tissues begin early. In acute septic coxitis, not infrequently an infiltration is observed in the soft tissues on the inner side of the pelvis. One can then observe on the diseased side a more or less increased breadth of soft tissue shadows proceeding down and along the inner edge of the pelvis. Roentgenograms showing a higher degree of contrast of the different soft tissue structures are necessary. Low radiation, varying between 35 and 45 kilovolts, and greater focal distance are necessary to produce roentgenographs of this type. The authors present 5 cases which demonstrate the value of soft tissue films.

FRANK L. HUSSEY, M.D.

Polyostotic Fibrous Dysplasia (Albright's Syndrome) and Its Comparison with Dyschondroplasia (Ollier's Disease). A Correlation of Roentgenological and Pathologic Findings. L. R. SANTE, WM. BAUER, and R. M. O'BRIEN. *Radiology*, 1948, 51: 676.

Polyostotic fibrous dysplasia was described in the earlier literature as a variant of osteitis fibrosa cystica (von Recklinghausen's disease). In 1937, Albright, Butler, Hampton, and Smith reported 5 cases, suggesting for the first time that the syndrome represents a distinct entity. In 1938, Lichtenstein differentiated the condition from other diseases with which it was confused and recommended that the name of polyostotic fibrous dysplasia be used for its designation.

The authors present 4 cases and discuss the clinical, roentgenologic, and pathologic features of the syndrome as well as the differentiation from cystlike lesions and Ollier's disease.

Clinically, fibrous dysplasia of bone has an insidious onset, the osseous changes developing at a very slow pace. Often the condition goes unsuspected for years until there is interference with proper function or a pathologic fracture occurs. The diagnosis is usually made by roentgen examination.

The most important roentgen findings in the early stage are tiny cystlike areas within the cortical structure, often fusing with each other and giving the appearance of pseudoexpansion. There is no evidence of periosteal elevation and osteoporosis does not occur. Later, the process leads to a shell-like thinning of the cortex complicated by spontaneous fractures which, however, heal readily by new bone formation. Under certain conditions varying degrees of sclerosis of the involved bones may occur.

The bone lesions have a tendency to unilateral involvement but in the advanced stages both sides may become affected. They are often associated with pigmented areas of the skin and sexual precocity in the female.

The etiology is unknown. It was suggested that the condition may be due to a congenital disturbance of the activity of the undifferentiated fibrous bone-forming mesenchyme, or to damage of the region of the hypothalamus, or to an anomaly of the sympathetic system and the adrenals. The serum phosphatase is sometimes increased but the calcium-phosphorus balance is not disturbed.

Microscopically, there is an osteoclastic absorption of the bone structure followed by fibrosis of the bone marrow in the cortical and subcortical areas. The process starts in the haversian canals and spreads to the surrounding structures. Sometimes a moderate periosteal bone deposition is noted despite the absence of such a sign in the roentgenograms. Rarely, small islands of hyaline cartilage may be embedded in the characteristic tissue of polyostotic fibrous dysplasia.

In the presence of the extraskeletal lesions, the differential diagnosis from other cystlike diseases of the bone is easy.

The differentiation from von Recklinghausen's disease is based on the fact that the latter nearly always shows marked osteoporosis due to hyperparathyroidism. The bone deformity in polyostotic fibrous dysplasia is caused by weakening of the cortex secondary to local enlargement of the individual lesions. In the very advanced stage, however, a distinction between the two conditions may not be possible from a study of the roentgenograms alone. A correlation with the clinical findings and mineral metabolism, or a biopsy may prove necessary.

The differentiation from Ollier's dyschondroplasia has not been widely discussed in the literature. On roentgen examination, this condition shows characteristic rarefaction at the diaphyseal ends of the bones with areas of intervening decrease in density due to remnants of cartilage. Either one or several bones may be involved. There is no periosteal reaction or other sign of new bone formation. Microscopically, Ollier's disease shows cartilaginous proliferation remaining within the bony structure rather than fibrous replacement.

The 4 cases are presented in detail, numerous roentgenograms and some photographs being used to illustrate the characteristic features. The opinion is expressed that the condition undoubtedly occurs much more frequently than was formerly supposed.

T. LEUCUTIA, M.D.

The Subarachnoid Spaces of the Root Sheaths in the Lumbar Region. K. LINDBLOM. *Acta radiol.*, Stockh., 1948, 30: 419.

Histological studies by Rexed revealed that the spaces adjacent to the root tips might form proliferations with cysts covered by a thin nervous tissue. In an effort to determine whether "Rexed cysts" were the same as widened endings of root sheaths as seen in myelograms, a roentgenographic and anatomic study of the lumbar root sheath was done on 35 specimens, and 150 myelograms were reviewed.

Anatomical studies revealed that the subarachnoid space varied with the length of the nerve root. Four specimens were injected with barium sulfate, subjected to roentgenography, and then cross sections, 1 mm. thick, were made of the nerve root, dural sheath, and adjacent ganglia. The barium in the subarachnoid spaces might project to the ganglia. The latter ended in fimbrialike tips projected between the roots and root bundles and were interrupted by incomplete septa. Cysts that were present did not communicate with the subarachnoid space and were not demonstrable in myelograms. Differences in the shape, size, and extent of the dural sac were considered as variations of the normal.

MAURICE D. SACHS, M.D.

Hip Lesions of Infants and Children Seen at the Newington Home and Hospital for Crippled Children. GILBERT W. HEUBLEIN, LOUIS BERNSTEIN, and B. J. HUBENET. *Radiology*, 1948, 51: 611.

As an introduction to the subject, the authors give an excellent discussion of the embryology, anatomy,

and roentgen anatomy of the hip joint. In connection with the last they painstakingly analyze the different methods used to localize various landmarks which are so important from the point of view of early diagnosis, especially in infants.

The anatomical components of the hip in the newborn are largely cartilaginous, which fact renders many structures invisible on the roentgenograms. In addition, slight variation in soft tissue detail in an otherwise normal-appearing hip may point to the presence of infection. Timely recognition of such diseases as coxitis and osteochondropathy may mean the difference between a satisfactory end-result and a subsequent crippling deformity. An early diagnosis is also of considerable help in the treatment of congenital dislocation of the hip.

The authors reviewed 300 normal hips of children up to 6 years of age examined at the Newington Home and Hospital for Crippled Children. Their findings paralleled and corroborated those of Kleinberg and Lieberman.

For the purpose of description the diseases of the hip in infants and young children were classified in the following manner:

I. Dislocation
  A. Congenital
    1. Congenital dislocation
    2. Arthrogryposis
    3. Dislocation associated with or secondary to spina bifida
  B. Acquired
    1. Traumatic
    2. Septic
    3. Still's disease
    4. Poliomyelitis
    5. Subluxation in muscular dystrophy
II. Osteochondropathy (Legg-Perthes disease)
III. Congenital coxa vara and epiphyseolysis
IV. Rare lesions
  A. Myositis ossificans
  B. Achondroplasia
  C. Osteogenesis imperfecta

Every one of these diseases is discussed in considerable detail, illustrative case histories and some very unusual roentgenograms being presented. A bibliography of 78 articles is appended.

T. LEUCUTIA, M.D.

Sickle-Cell Anemia in Adults: Roentgenographic Findings. OMAR LEGANT AND ROBERT P. BALL. *Radiology*, 1948, 51: 665.

Sickle-cell anemia is a chronic hemolytic disease which occurs almost solely in the negro race. The condition was first reported by Herrick in 1904. Since then numerous other articles appeared in the literature dealing with various phases of this condition. It is now estimated that about 7 per cent of the negro population show the phenomenon of sickling (sicklemia) and that 1 or 2 per cent of these develop severe sickle-cell anemia.

The mortality rate from sickle-cell anemia is not known. Many of the affected persons die during infancy and childhood but some complete a normal span of life. The terminal phase is characterized by extreme prostation, peripheral vascular collapse, and shock.

The authors studied the roentgen findings in 26 cases of sickle-cell anemia in adults seen at the Presbyterian Hospital in the city of New York since 1930. A postmortem examination was performed in 5 of the 26 cases.

The most frequent abnormal roentgen finding was enlargement of the heart (13 cases). There was no characteristic configuration and in the 5 autopsies no valvular lesion was found. The cardiac enlargement is thought to be the result of compensatory hypertrophy and dilatation in response to the long-standing severe anemia and anoxemia.

Next in frequency was generalized osteoporosis (11 cases). About one-fourth of all cases showed definite bone infarction. The bone lesions consisted of biconcave deformity of the vertebral bodies (4 cases), patchy cortical thickening of the long bones (7 cases), and localized bone infarcts, not unlike those seen in caisson disease (5 cases).

Four of the 26 cases showed nothing abnormal on the roentgenograms.

One unusual case is reported in detail. It showed an infarction of the body of a vertebra which was studied by means of serial roentgenograms, from its inception to healing 18 months later.

The clinical features and laboratory findings of the 26 cases are summarized in tabular form, and some very interesting roentgenograms are presented to illustrate the salient roentgen findings.

T. LEUCUTIA, M.D.

The Roentgenologic Changes in Sickle-Cell Anemia. STANLEY H. MACHT and PAUL W. ROMAN. *Radiology*, 1948, 51: 697.

This article is based on a study of 48 cases of sickle-cell anemia observed at the Baltimore City Hospitals from 1936 to 1947. Twenty-nine of the patients were children under 14 years of age.

The most common findings were: cardiac enlargement (76.2%), pneumonia (38%), coarsening of the trabeculae of the long bones associated with widening of the marrow cavity and thinning of the cortex (57.1%), similar changes in the short bones (35.2%), and the infarction type of destruction of the bone. After healing a roentgen appearance reminiscent of caisson disease is produced.

There is a definite time interval between the appearance of the clinical symptoms and the roentgen demonstrability of the bone changes. In 2 of the authors' cases the first roentgen examination, made soon after the onset of pain, swelling, and local heat of the affected area, remained negative, but a second examination made 3 weeks later showed evidence of bone destruction involving both the marrow and the cortex. Repair occurs after a long period of time.

If the thrombosis obliterates the blood supply near the articular surfaces, a permanent destruction of the joint may result. The authors observed 2 such

cases, one with destruction of the wrist and the other with destruction of the hip.

Thromboses of the capillaries of the skin lead to chronic ulcers of long duration, especially at the ankles. The secondary infection which is common in these ulcers often produces periosteal changes in the underlying bone similar to those observed in varicose ulcers.

The poor nutrition of the tissues leads to general changes consisting of a linear habitus, emaciation, long extremities, short trunk, upper dorsal kyphosis, deep chest, protuberant abdomen, spider hands, and occasionally a slight turrecephaly. Abnormal dentition and delayed osseous union have also been found.

The authors have arranged all the roentgen changes in a tabular form which is as follows:

1. Roentgen evidence of involvement of the viscera
   (a) Cardiac enlargement
   (b) Pathological changes in the lungs
   (c) Enlargement of the liver; cholelithiasis
   (d) Enlargement of the spleen in children—possible calcification later in life
2. Skeletal changes due to hyperplasia of the erythroblastic elements
   (a) Long bones
      (1) Irregular trabeculation
      (2) Widening of the medullary spaces
      (3) Cortical thinning
   (b) Short bones and flat bones
      (1) Exaggeration of trabecular markings of the ilia, scapulae, phalanges
      (2) Cupping of the vertebral bodies
      (3) Skull: Widening of the diploe, thickening of parietal and frontal bones, thinning of outer tables, and radial arrangement of trabeculae
3. Skeletal changes due to thromboses
   (a) Long bones
      (1) Cortical thickening
      (2) Narrowing of medullary cavity
      (3) Loss of bone tissue
      (4) Periosteal reaction
   (b) Short bones
      (1) Necrosis and resorption of bone
      (2) Periosteal reaction
4. Skeletal changes due to disturbances of growth.

T. LEUCUTIA, M.D.

The Angiocardiographic Measurement of the Normal Great Vessels. CHARLES T. DOTTER and ISRAEL STEINBERG. *Radiology*, 1949, 52: 353.

Recognizing a need for greater accuracy of measurement of the great vessels, Dotter and Steinberg have used angiocardiographic material in an attempt to establish some normal values. One hundred selected patients were measured at various specific sites, and the minimum, maximum, and average values for the series recorded.

The authors anticipate that a larger series of similar measurements will support their preliminary data. Those interested in this subject should consult the original diagrams of sites measured and the tables of measurements. PAUL W. EYLER, M.D.

The Aid of Arteriograms in the Diagnosis and Treatment of Intracranial Aneurysms. JAMES L. POPPEN. *Radiology*, 1949, 52: 347.

This article is based on a series of 114 intracranial aneurysms occurring in 110 patients studied at the Lahey Clinic. In all but one of the cases the cause was presumably a congenital defect in the arterial wall. The 1 exception was found to be due to a mycotic embolism. Twenty-three of the patients were hypertensives and none of them had syphilis. In 63 cases the aneurysm occurred on the left side, and in 47 on the right side. Seventy-two of the patients were females and 38 were males. The majority of the symptoms occurred in patients between the ages of 20 and 60 years, the youngest being 14 years and the oldest, 70.

The symptomatology of this condition is variable and there is no definite clinical syndrome. The symptoms found in the 110 cases and arranged in the order of decreasing frequency were: subarachnoid hemorrhage, cranial nerve changes, unilateral headache, generalized headache, convulsions, vertigo, facial pain, the migraine type of headache, and signs of hypopituitarism.

It is desirable to make the diagnosis of an intracranial aneurysm prior to rupture as 35 per cent of the patients in this series died on the first rupture and 21 per cent died because of recurrent hemorrhages.

It is necessary to know the tolerance of the affected hemisphere to reduction in the blood supply. This can be found by temporarily occluding the internal carotid artery by digital compression. If an irritable carotid sinus is present the compression should be on the common carotid artery well below the bifurcation.

If the aneurysm is large enough, plain roentgenograms of the skull may show a unilateral enlargement of the sella turcica, elevation or thinning of one of the anterior clinoids, or thinning of the lateral margin of the optic foramen. At times, calcification within the aneurysm may be seen.

In this series of cases thorotrast was originally used as the contrast media, but diodrast is now used more frequently. Since 75 per cent of intracranial aneurysms involve the anterior two-thirds of the circle of Willis this portion should be visualized first. If the closed method is used the posterior third can be visualized by occlusion of the internal and external carotid arteries during injection of the common carotid. The Lahey Clinic uses the closed method more routinely than the open method because often both sides have to be investigated and the closed method is a minor procedure compared to exposure of both the carotid arteries.

The closed method is carried out with the patient on his back with his head in the horizontal position alongside of an upright automatic Bucky diaphragm. An 18 gauge needle, 2 inches long and attached by

means of a two way petcock to a 20 c.c. Luer-Lok syringe, is introduced into the common carotid artery 1 or 2 cm. caudad to the bifurcation. When the needle is in the artery some citrate solution already in the syringe is injected to prevent clotting of the blood in the syringe and needle, and then a syringe containing the diodrast is attached to the needle. The needle is directed laterally and downward so that the contrast media enters the internal carotid artery and not the external. While 15 c.c. of diodrast are being injected as rapidly as possible, the first exposure is made, the stereoshift is carried out, and a second exposure is taken. The author finds that this lateral stereoview is more valuable than a single lateral and a single anteroposterior view. The entire procedure requires great co-operation between the neurosurgeon and the radiologist.

JOHN W. HOPE, M.D.

Place of Deep External X-Ray Irradiation in the Treatment of Carcinoma of the Cervix by Long Element Needles. GEORGE W. WATERMAN and WILLIAM A. REID. *Radiology*, 1949, 52: 34.

The authors review their experience over a 10 year period (from 1933 to 1942) at the Rhode Island Hospital, Providence, Rhode Island, with the treatment of 347 cases of cancer of the cervix. One hundred and thirteen patients were treated primarily with radium needles alone, and 234 were treated primarily with radium needles and x-rays. The 5 year survivals in this group was 154, or 44.4 per cent.

In order to give a more accurate picture, comparisons between the two groups are made on the basis of similar clinical stages. The Schmitz classification was used. Stages 1 and 2 represent the operable or favorable group and stages 3 and 4 the inoperable and still purely radiological group.

In reviewing the statistics of the cases it is noted that 56 patients in stages 1 and 2 who were treated by interstitial radiation alone showed a 5 year salvage of 45, or 80.4 per cent. On the other hand, the salvage for a similar group of 77 operable patients treated by radium needles and x-ray irradiation was only 64.9 per cent, a difference of 15.5 per cent in favor of radium alone. In the inoperable or unfavorable group (stages 3 and 4) there was a 22.8 per cent survival for the 57 patients treated with needles alone and a 29.3 per cent survival for 157 patients receiving x-ray irradiation in addition to the radium.

The incidence of complications was markedly higher in the operable cases when x-rays were used with needles, being 22.1 per cent or more than twice that with needles alone (10.7%). In the inoperable group the gross incidence of complications did not vary so widely. The group treated with needles and x-rays showed fewer complications—12.1 per cent as compared with 14 per cent when radium alone was used.

The incidence of fistula in patients treated with needles alone was 3 in 113, or 2.7 per cent, occurring in patients with carcinoma of stages 3 and 4. In the patients treated with needles and x-rays the fistula incidence was 13 in 234, or 5.6 per cent. Five of these had carcinoma in stage 1 or 2, an incidence of 6.9 per cent for these two stages. In 94 patients to whom x-ray therapy was given less than 1 month before or after radium treatment, the incidence of complications was 22.3 per cent as compared with a gross incidence of 12.3 per cent for all stages when radium was used alone. By increasing the interval to at least 8 weeks between the radium and x-ray therapy the complications were cut down. The use of a 4 cm. lead strip over the lower abdomen above the symphysis was found to reduce the x-ray overdosage to the paracervical area, which was considered responsible for some of the complications.

The x-ray factors used were 200 kv., 20 ma., target skin distance 50 cm., filter 0.4 mm., of tin (Thoreaus). Two large fields (one anterior and one posterior) were used. The method of radium treatment consisted of using 2 and 3 mgm. needles (a total from 24 to 30 mgm. in early cases, and rarely more than 50 mgm. in late cases), and a 20 mgm. cervicouterine application, gamma radiation, 0.5 mm. of platinum filter, and a long interval of 168 hours or 7 days.

The authors conclude that in making use of long paracervical and parametrial element needles, great caution should be used in stages 1 and 2 when x-ray radiation is given externally. The cervix and paracervical triangle should be shielded as much as possible. An interval of from 9 to 12 weeks after treatment with radium before use of x-rays gives the best results with regard to freedom from complications. In badly infected and more advanced cases preliminary x-ray therapy has its proper place.

FRANK L. HUSSEY, M.D.

RADIUM

Probable Trends in the Irradiation Treatment of Carcinoma of the Cervix Uteri with the Improved Expanding Type of Radium Applicator. EDWIN C. ERNST. *Radiology*, 1949, 52: 46.

The author presents an improved type of radium applicator to meet the problem of obtaining a greater degree of radiation effectiveness in the potential metastatic parametrial pelvic field, in the treatment of carcinoma of the cervix uteri. More effective and uniform irradiation is obtained by use of this radium applicator. The uniform spacing of multiple equal radium sources is not disturbed when the lateral capsules of this particular type of radium holder are expanded to pre-established fixed positions, irrespective of the anatomical size and shape of the vaginal vault or the extent of the malignancy.

The applicator is so constructed that in the closed position the transverse diameter measures less than 3.0 cm., which makes for ease of introduction. The lateral colpostats are expanded mechanically by use of a rotating knob on a handle which is detached after introduction, and the applicator is packed and fixed in the desired expanded position. The cervical stem of the applicator, when three longitudinal capsules are employed, is approximately 7 cm. in

length. The distal stem can be removed if less length is desired. The two lateral colpostats can be expanded to the desired extent to contact the parametrial fields effectively. When the lateral transverse diameter measures only 5 cm., four or five radium capsules can be comfortably introduced. The 6.5 cm. vault occasionally will accommodate six radium capsules. If the cervical canal is occluded, the cervical stem of the applicator may be removed. The roof and floor of the vaginal vault are packed with a single narrow gauze strip to maintain constant pressure on the radium holder. Roentgenograms taken after insertion of the applicator are of value to determine its position. In a contracted vaginal vault, only four or five capsules can be accommodated. The radium compartments of the applicator are for either one, two, or three 10 mgm. needles.

Injury to the bladder and the rectum are minimized due to the design and mechanical features of the lead-filled ends of the vertical radium capsules. The radiation distribution has been evaluated for both the single capsule and the total radium intensity effects of the applicator upon photographic films by substituting a presdwood phantom for the soft tissues of the pelvis in order to determine that all the surrounding pelvic fields were uniformly and effectively irradiated.

The studies show an improved field of radiation around the present applicator which employs nine equally spaced radium sources. Unequal distribution of the radium sources within the cancer fields or the surrounding normal structures of the pelvis creates a clinicobiological irradiation hazard.

From the standpoint of clinical research, this method facilitates the more accurate comparison and clinical evaluation of the relative effectiveness of various radium application in relation to the time and intensity factors of the total radium dose.

FRANK L. HUSSEY, M.D.

MISCELLANEOUS

The Lethal Dose of Total Body X-Ray Irradiation in Swine. JOHN L. TULLIS, CARL F. TESSMER, EUGENE P. CRONKITE, and F. W. CHAMBERS, JR. *Radiology*, 1949, 52: 396.

The effect of ionizing irradiation on swine was studied in an effort to better interpret the data obtained in the Bikini tests. Experiments on swine are of value because of a closer similarity to the radiosensitivity of man.

A one million volt unit operating at 3 ma. (angle beam of 95 to 135°), 1 meter distance, and at 30 roentgens per minute, was used. Two lateral fields were given to each swine over a 45 minute period, the dosages varying from 200 to 600 roentgens in air. All swine were sexually mature, from 12 to 15 months old; there were 4 females and 4 males in each group.

Results within a period of 30 days following irradiation showed no difference as far as sex was concerned. Of the 8 animals receiving 200 roentgens, one (12.5%) died; of the 8 animals receiving 300 roentgens, 5 (62.5%) died; 7 of 8 (87.5%) that received 400 roentgens, died, and 8 of 8 (100%) that received 600 roentgens, died.

The results of these studies show that in spite of some differences in the ionizing components of the atomic bomb and one million volts, the biologic responses are similar and comparable.

MAURICE D. SACHS, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Venous Pressure in Relation to Blood Volume in Man. MARTIN E. ANDERSON, JR., and JOHN S. LUNDY. *Anesthesiology*, 1949, 10: 145.

In the state of shock, the effective volume of the circulating blood is reduced. This may be due to actual loss of blood volume (as whole blood or plasma), to pooling of the blood in the venous reservoirs of the body, or to other factors such as heart failure. When the effective blood volume of the body is reduced, there is a measurable drop in the blood pressure, often greater on the venous than on the arterial side. With recovery from shock, the arterial and venous pressures approach more nearly normal limits.

It is an easy matter to make frequent observations of the arterial blood pressure, and much reliance is placed on these determinations in evaluating the efficacy of management of the patient in shock. It is unfortunate that a record of the venous pressure is not so easy to obtain, for the venous pressure also reflects the disparity between the capacity of the circulatory bed and the volume of the circulating fluid within the vascular system. A drop in the venous pressure may be an earlier warning of impending shock than is a fall in the arterial pressure.

Since it has been found that the effective blood volume drops in shock and is restored toward normal as this condition is overcome by replacement of the lost fluid, two series of observations were made to determine whether measurement of the relative venous pressure could be used as a method of measuring this change. In the first series, the change in venous pressure was measured on 25 human donors after removal of 500 c.c. of blood. In the second series, the change in venous pressure was determined in 20 patients after the infusion of 500 c.c. of whole blood. As a corollary to this latter series of observations, the change in venous pressure was determined in 20 postoperative patients after infusion of varying amounts of saline solution at a constant rate.

The authors found that it is a simple matter to obtain venous pressure determinations when intravenous therapy is in progress by attaching to the intravenous tubing a venous pressure manometer with its saline reservoir. It is believed that determinations of venous pressure accurately reflect changes in the total blood volume which are more difficult to discover by other methods. The procedure has a limited usefulness in guiding the intravenous therapy of patients in surgical shock, and might also be of value when solutions are to be administered intravenously to patients with a variety of conditions in which further increase in venous pressure is to be avoided, such as congestive heart failure, constrictive pericarditis, ascites, and Banti's disease.

Rapid withdrawal of 500 c.c. of blood from each of 25 donors produced a fall of venous pressure from an average resting value of 112 mm. of saline solution to 77 mm. Transfusion of 500 c.c. of whole blood into 20 patients produced a rise of venous pressure from 64 mm. to 92 mm. Infusion of physiologic saline solution did not restore the venous or arterial pressure to the preoperative level.

The Common Nonvascular Nevi and Their Treatment. A. J. DELARIO. *Am. J. Surg.*, 1949, 77: 53.

The commonness of the various forms of pigmented and nonpigmented nevi is established, and a classification of these many and varied lesions is given. Nevi are defined as skin lesions containing neval cells with or without pigment, and with or without hair. Their origin is probably from nerve tissue, due to their ability, through the neval cells, to produce pigment, and the fact that the production of melanin is under the control of the pituitary, adrenal, and gonads—other derivatives of nervous tissue.

Differentiation between pigmented nevi, and other similar lesions such as seborrheic warts and senile keratoses, may be made on the fact that when superficial layers are removed the base is still easily identifiable. Further differentiation may be made on degeneration in which other lesions form basal or squamous cell carcinomas, whereas pigmented nevi form melanomas.

Malignant degeneration must be suspected when changes in size, shape, or coloration take place. Most common are (1) the small deeply pigmented nevi, with or without hairs, which occur especially on the extremities, and (2) the soft, smooth, slightly elevated, moderately pigmented mole, which is not common on the extremities. From 30 to 60 per cent of malignant melanomas arise from recognizable pigmented nevi; fewer, however, arise from the hairy types. They may occur at any age from 6 months on; however, the average age of onset is 50 years. Usually, they do not metastasize before puberty. They occur anywhere—most frequently on the head, neck, foot, and trunk.

Prophylaxis consists of removal. Criteria have been established to include those that are darkly pigmented, those appearing suddenly late in life, those subjected to trauma and irritation, those which show increased pigmentation, and those that show signs of hemorrhage.

Methods of treating nevi vary from simple excision or electrocautery to multiple-stage resection of the larger types with removal of the proximal lymphatic chains. In some instances in which disfigurement would be excessive, lesions were irradiated in the hope that a few of them might be radiosensitive. The cure rate in presented case studies has not been higher than 33 per cent, including all types of therapy.

ARMAND D. ALBRECHT, M.D.

Studies in the Virulence of Clostridium Welchii. W. A. ALTEMEIER and W. L. FURSTE. *Surgery*, 1949, 25: 12.

It has long been recognized that certain types of wounds, such as extensive lacerations, compound fractures, or crushing injuries are particularly prone to develop gas gangrene. In World War I, Callender and Coupal found the incidence of gas gangrene to be from five to six times higher in compound fractures than in soft tissue wounds. Gas gangrene is of multiple bacterial etiology; a great variety of gas-producing anaerobic bacteria have been found associated with this condition, although the fact remains that the Clostridium welchii is the principal cause of gas gangrene and was present either alone or in association with other gas-producing anaerobes in from 56 to 100 per cent of the patients who were studied.

Since the Clostridium welchii is found in all human environment with widespread distribution in the soil, sewage, the hair of domestic animals, dust, skin, and vaginal tract, contamination of a considerable proportion of the open wounds is almost inevitable, and the average incidence of contamination of 3,027 collected wounds was 15.7 per cent. Nevertheless, clinical gas gangrene is relatively infrequent, with an average incidence as an infectious complication of open wounds of 1.62 per cent. Clinically, when a muscle is deprived of its blood supply for 6 or 8 hours, it usually dies, and hence it becomes a more suitable site for Clostridium development. This explains the gas gangrene which sometimes takes place following thrombosis or embolism.

A study to measure accurately the effect of crushed muscle and dirt on the development of gas gangrene, and, if possible, to evaluate the importance of these two factors was undertaken. Measured doses of the Clostridium welchii of high virulence were injected into the thigh muscles of guinea pigs which were (a) normal, (b) traumatized by crushing 5 times with a Kocher clamp, and lacerated by a twisting clamp, and (c) traumatized as before with the addition of 1 c.c. of an autoclave and a finely divided mixture of soil and cinders in the wound just before closure.

It was found that 1,000 times fewer bacteria were required to produce fatal gas gangrene in lacerated muscle than in healthy muscle, and that 1,000,000 times fewer bacteria were required to produce fatal gas gangrene in the presence of devitalized muscle and dirt than when injections were made directly into healthy muscle.

The factors governing the virulence of the same strain of Clostridium welchii are not well known. It is clear that the potential virulence of the same strain may vary considerably, even under apparently identical conditions (passage through pancreatic digest medium enhances the virulence of the strain of Clostridia used in these experiments, as does weekly passage through pigeons).

FRANK B. QUEEN, M.D.

Blastomycosis Infestation with the Paracoccidioides Brasiliensis. Anatomopathologic Study and Fluorescent Coloration of the Parasite (Blastomicosis por paracoccidioides brasiliensis. Estudio anatomopatologico y coloración fluorescente del parasito). JUAN C. RADICE AND SALOMÓN KAPLÁN. *Rev. As. méd. argent.*, 1949, 63: 61.

The cadaver turned over to the authors for study presented numerous lesions of the mouth, tracheobronchial tree and lungs, right suprarenal gland, and both lobes of the cerebrum. There were suggestive lesions palpable in other organs (spleen and pancreas); however, those cited were the only ones subjected to extensive study. All the lesions examined were either in the form of ulcerations, nodular infiltrations, or abscesses, and all were typical of the reported lesions of blastomycosis, that is, they were not easy to distinguish from those of tuberculosis.

For more definite and more frequent recognition of the parasite the authors resorted to a special form of treatment of the tissues. The tissues were first cut into microscopic sections (7 microns) by the usual paraffin fixation method, then the paraffin was removed with xylol, and the section was rehydrated with decreasing strengths of alcohol and treated with phosphomolybdic acid (1 per cent) for a half hour and then stained with primulin (1 to 5,000) for 24 hours. The tissue sections were then dehydrated a second time, cleared with xylol, and mounted in Canada balsam. The preparation was then exposed to the rays of the sun or to rather long waves (3,650 U. A.) of ultraviolet light. When rendered fluorescent the sections were examined by means of special filters and a special fluorescent microscope.

The Paracoccidioides brasiliensis is identifiable by its fluorescent effects. It has a secondary fluorescence, colorless, brilliant, and luminous. The parasites were found in the giant cells in the pulmonary tissues, in the suprarenal gland tissues, and in the tissues of the brain. In each case, and especially in the brain tissues, it was found that by this method of fluorescent staining the limits of the lesions could be more accurately determined, the parasite could be more surely recognized, and that the organism could be found much more frequently than with ordinary hemotoxylin-eosin staining.

JOHN W. BRENNAN, M.D.

Studies on the Self-Disinfecting Power of the Skin. A. HELLAT. *Ann. med. exp. biol. fenn.*, 1948, 26: Supp. 8.

In the present study, the author seeks to explore and appraise the problem of self-disinfection of the skin. Hellat attempts to determine whether the skin possesses self-disinfecting powers. If so, he wishes to determine the nature of this power if it is detectable. Finally, he attempts to determine whether the self-disinfecting mechanisms of the skin may account for the type of microflora found upon normal skin.

In this investigation, various test organisms were used and the tests were conducted in the Second

Surgical Clinic of the University of Helsinki. All tests were performed upon normal healthy skin which had been kept unwashed for at least 3 days. The skin was not shaved at any time.

Some 13 experiments were performed with use of the various test media upon the skin of the forearm, palm, and sole of the foot, as well as in the armpit. As a result of these experiments it was shown that the survival of bacteria differs greatly even under favorable conditions. Further, the author is certain that no highly active bactericidal or inhibitory agent was found in the skin, with the possible exception of lysozyme. BENJAMIN GOLDMAN, M.D.

Lack of Extractable Carcinogens in the Skin of Patients with Multiple Precancerous Keratoses of Actinic Origin. FREDERIC E. MOHS. *Cancer Res.*, 1948, 8: 371.

The possibility that the skin of patients with multiple precancerous keratoses of actinic origin might contain extractable carcinogenic chemicals was considered and investigated. Twelve patients with such lesions, and who previously had carcinoma, were selected for study. All were instructed to wash one side of the face daily with benzene on gauze pads, saving the pads for extraction. This material was then extracted and concentrated.

Painting the skin of mice with this extract three times weekly for a period of 1 year produced no neoplastic changes. The addition of croton oil to the benzene extract produced some thickening and ulceration of the skin, but no carcinomas. A group of mice were then given ultraviolet radiation to both ears, and the right ears were painted with the extract; however, the results showed no augmenting effect of the skin extracts, and carcinomas developed on both ears equally. Subcutaneous injections of the extract into mice produced no neoplasms, and similar results were obtained by the implantation of whole keratoses. The patients showed no difference in the two sides of their faces as the result of washing with benzene, since carcinomas developed with equal frequency on the washed and unwashed sides.

These findings are believed to be evidence in favor of the hypothesis that the carcinogenic influence of ultraviolet rays is exerted by a direct effect upon the cell constituent responsible for neoplastic change rather than the formation of a carcinogenic chemical.
ROBERT MAYO TENERY, M.D.

The Cancer Problem. C. P. RHOADS. *J. Urol.*, Balt., 1948, 60: 797.

The author states that outstanding developments in the induction and control of cancer in man have come from the study of the bladder, prostate, and adrenal glands.

The bladder cancer which follows exposure to B-naphthylamine is the only instance of the production of a malignant tumor in man by a pure chemical compound of known composition.

Its induction led, furthermore, to the demonstration that certain forms of experimental cancer, due to the administration of azo dyes to animals fed inadequate diets, can be prevented by specific food constituents.

The second great contribution of urology to cancer was a procedure for the potential control of human neoplasms. From a mass of standard experimental work, it was more than obvious that the prostate, like the breast, requires a hormone (male in this case) not only for its development but for its very existence.

The author points out that castration, at least temporarily, causes cessation of growth of the neoplastic cells.

The author then goes on to discuss the history of tar as a cause of cancer and how British workers isolated pure crystals from tar that proved to be cancer-producing. Shortly afterward the molecules of pure female and male hormone were described.

It was obvious that the cancer-producing substance from tar and the steroid sex hormones had some similarity.

The chemical relationship between carcinogen and steroid hormone suggested, of course, the most important concept since the observation of Pott. This was that cancer in man may be due perhaps to a manufacturing mistake by the body in which there is formed a carcinogen instead of a natural hormone.

Two very well established, but oftentimes forgotten, clinical facts show adequately the participation of some systemic generalized factor in the cause of cancer. The first of these is the rather frequent occurrence of multiple primary cancers. Every student who has investigated this subject has provided confirmatory information. A recent and important study is that of Warren and Ehrenreich, who showed that at autopsy 6.8 per cent of their patients dying of cancer had multiple primary growths, and these were not the simple multiple primaries involved in the tiny, comparatively benign, basal-celled epitheliomas of the skin.

Rather more important in support of this thesis of the systemic or biochemical metabolic origin of cancer is the astonishing tendency of cancer of the same organ to occur coincidentally in single-ovum twins. The proof that this is truly a matter of the similar genes of the monozygotic twins is at hand because of the fact that of 13 pairs of double-ovum twins with tumors of one, only 2 presented involvement of the second twin. Macklin's series of similar and dissimilar tumors in twins, both of whom were affected with tumors, is particularly interesting. Among the monozygotic twins, there were 22 similar tumors and only 1 dissimilar tumor, whereas among the dizygotic twins, there were only 6 similar and 7 dissimilar tumors.

Support for the systemic origin of cancer is found in seven other factors:

1. The tendency of testicular tumors to occur in cryptorchids, and their treatment by pituitary extracts.

2. The occurrence of uterine cancer with granulosa-cell tumors of the ovary.

3. The experimental production of adrenal tumors by the castration of certain strains of very young animals and by the intrasplenic transplantation of genital tissue.

4. The effect of biologically active steroids on cancer of the prostate gland in man and of the breast in women is well known.

5. The administration of estradiol to experimental animals is capable of producing regularly no less than five different types of malignant neoplasms.

6. There is a profound peak for many forms of cancer at the age of the menarche and menopause, and sex-linked cancer is enormously common, so much so as to make reasonable the statement that the malignant neoplasm is one of the most fundamental importance.

7. The geographical incidence of cancer provides further confirmatory evidence for the etiologic role of a general disorder.

The author then discusses the search for endocrine substance in the urine of individuals with cancer.

He notes certain compounds are absent in individuals with cancer and other substances not found in normal urine are found in the urine of individuals with specific types of cancer. One substance in particular "Δ^9Etiocholenolone" is of particular interest. He presents an interesting case in which the urine was studied for 2 years prior to discovery of the cancer and for several years after its excision.

Paget's disease is a condition peculiarly liable to be due to, or associated with, an abnormality of steroid hormone metabolism, because of the important role played by these hormones in bone growth and calcification.

For these reasons an ideal patient with Paget's disease was hospitalized for a long period and patterns of urinary steroid excretion were prepared. An extraordinary abnormality was apparent. One wholly new steroid, of a type never found in any other urine, was present.

The author states that they have found that in patients with cancer there is adequate evidence indicating a disturbed manufacture of steroid hormones, a fact which is significant but not specific for the disorder. He suggests that before cancer is obvious a similar disturbance of hormone manufacture is present. He has evidence that in conditions which are fully accepted as precancerous (notably Paget's disease of bone) abnormalities of steroid hormone excretion are present, a fact which warrants the belief that this condition is endocrinologic in origin. GEORGE W. RICHARDSON, M.D.